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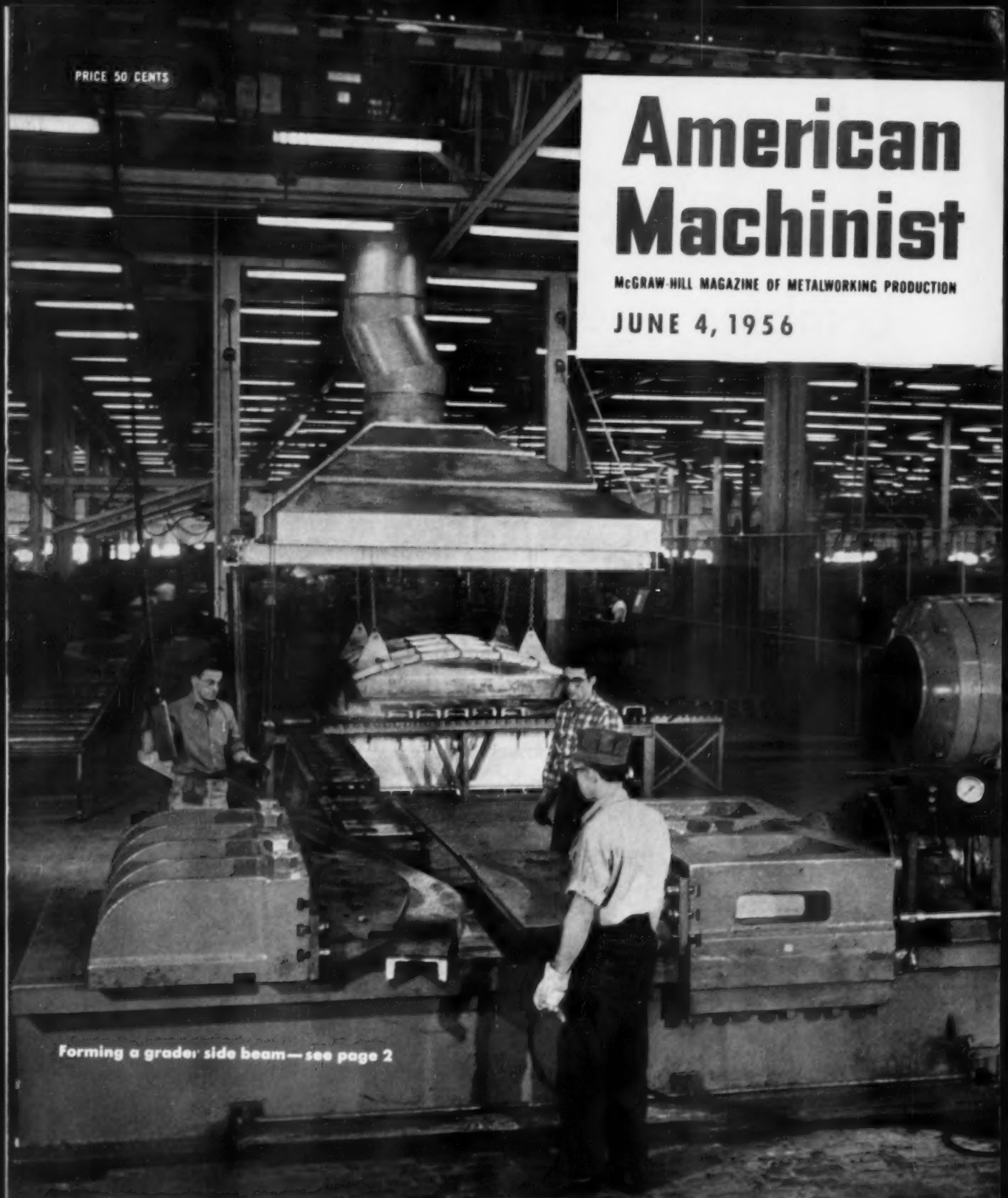
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JUNE 4, 1956



Forming a grader side beam—see page 2

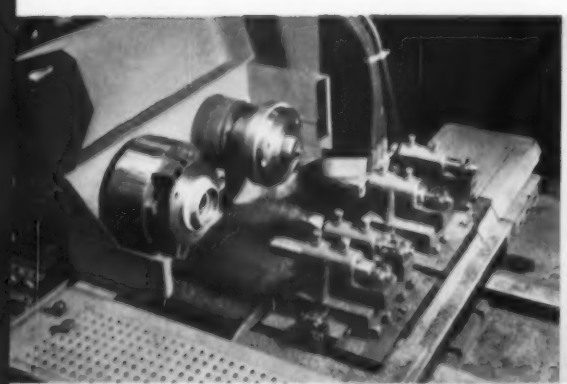
Compression & Transfer Mold Tooling — A SPECIAL REPORT

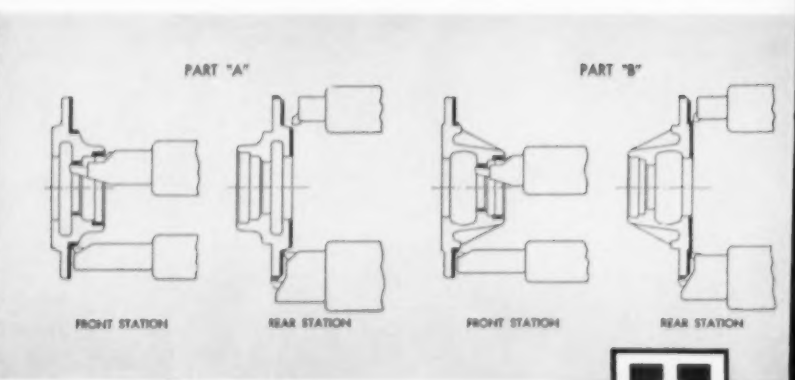
Power Brushing . . . Abrasive Cutoff

The ability of Heald **BORIZING*** to

combine operations and reduce handling time can make other precision finishing methods obsolete, regardless of age of equipment

FOR EXAMPLE: *This One Bore-Matic Replaced Two Older Machines and Increased Production more than 50%*





This new Heald Model 321 Bore-Matic performs combined boring, turning and facing operations on both ends of two different differential bearing carriers, as shown in the diagrams above. The job was formerly done in sequential operations on two separate machines, at a net production of 105 parts per hour. Borizing on this single-machine setup increased production to 166 parts per hour, with closer tolerances, better finish and much easier operation.

It PAYS to come to Heald

HEALD®

**Borizing is a copyrighted word meaning the application of any number or variety of precision finishing operations performed on a Heald Bore-Matic.*

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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chips

HORIZONTAL PRESS . . . Our cover shows the bending of box beams for the frames of motor graders. A 500-ton Lake Erie hydraulic press, in the newly opened Decatur (Ill) plant of Caterpillar Tractor, hot forms the beams after they are heated to 1800 F as they move across the covered opening of the pit furnace in the background. This was one of the key operations described in our article on the new plant (*AM*—May 21 '56, p118), but we thought you would like a second look at it in color.

COMPRESSION MOLDING . . . Next week the Society of the Plastics Industry holds its annual meeting and show in New York's Coliseum. To wrap up our pre-show coverage, we have the second of two Special Reports on tooling for plastic molding. The first (*AM*—May 7 '56, p137) covered injection molds. This one deals with compression and transfer molds. Latest mold tooling ideas are described, including a 20°-offset milling spindle and a thread-milling fixture. The report is the work of Associate Editor John Wright and Ed Callahan, project engineer for GE at Taunton, Mass. Most of the mold designs described are the work of Richard H Sharland, head of the drafting department at GE Taunton.

CUT-OFF PROBLEMS . . . Five common faults in wet abrasive cut-off are described and the cures are prescribed in a valuable summary by P C Dooley (see biography) . . . Titanium bandsawing is possible with certain modifications of steel-cutting equipment. The procedure is reported by L O Montgomery and G W Baner of Mallory Sharon Titanium.

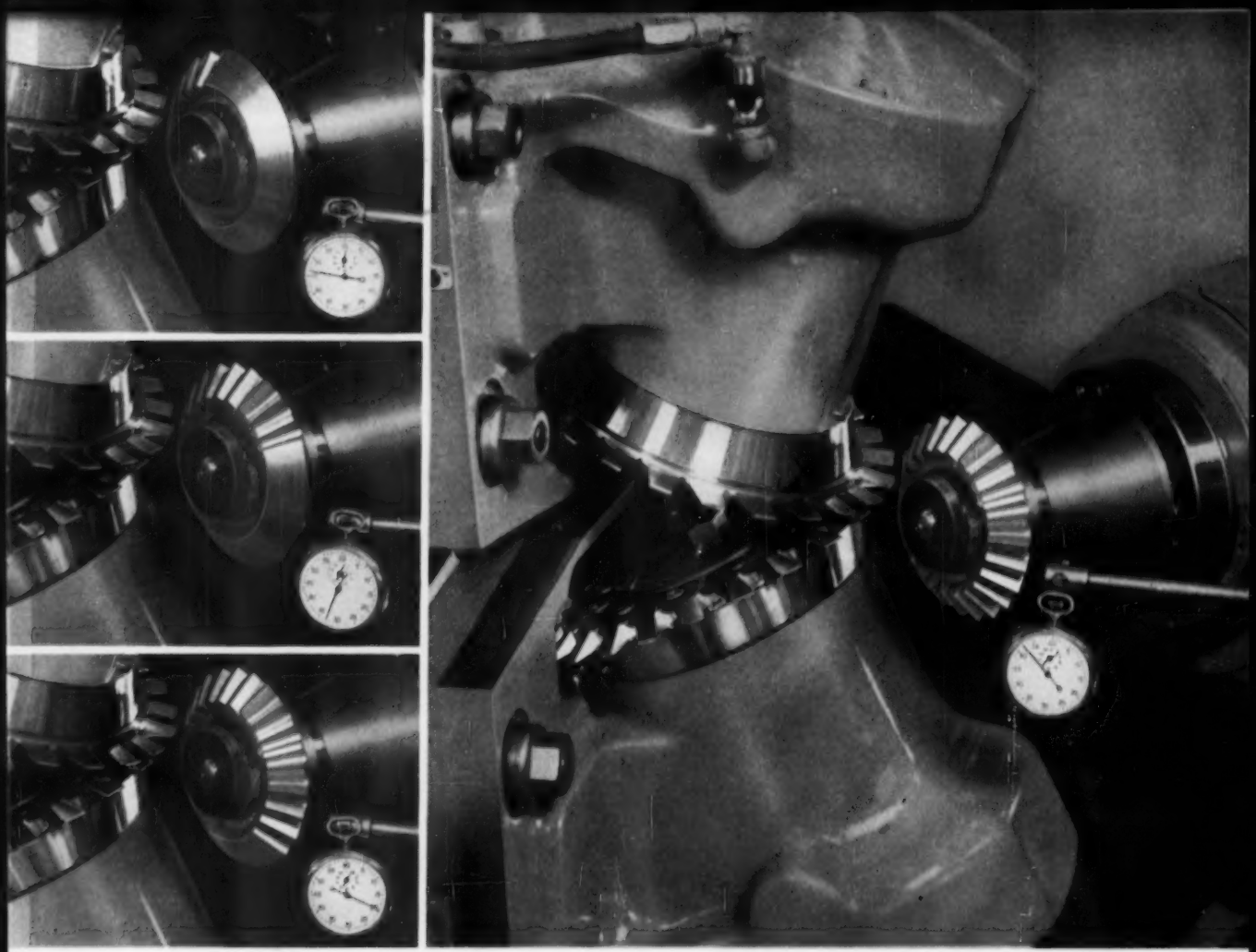
TRAINING BASE . . . A unique pyramid approach to management training at Jack & Heintz was described last year (*AM* — Apr 25 '55, p118). Now J&H has put the base under the pyramid by extending the training program to include all employees. Associate Editor George De Groat describes this logical extension in our lead article.

BRUSHING . . . Otherwise difficult jobs can sometimes be handled by special brush tooling. Case histories compiled from the Brush Application Lab of Fuller Brush will broaden your thinking about the possibilities in metalworking operations.

SCHEDULING . . . Any large unit, be it a ship, a turbine, or a special machine, presents complex scheduling problems. The U S Navy has a special activity working on the problem. The method developed and described by H M Neuhaus has broad application to all scheduling of large-unit production.

COMING . . . *AM* for June 18 includes a Special Report on the John Bean Tank Plant of Food Machinery & Chemical Corp. Several articles deal with inspection, covering air gaging, ultrasonic testing, and optical inspection of transparencies. Among other articles will be one on a master control for stamping and some Italian heat-treating practice.

PETER C DOOLEY was assistant manager of the Mechanical Laboratory at The Carborundum Co when he wrote the article for our current issue on the common faults with wet abrasive cut-off and how to correct them. Following a tradition that AM authors are frequently promoted about the time their article appears, he has recently been promoted to assistant to supervising engineer of Carborundum's Electro Minerals Div. Mr Dooley is a graduate of Worcester Polytechnic Institute. Prior to this he was a laboratory technician at MIT and after graduation he attended the U S Diesel Engine School at the Navy. He joined Heald Machine Co as a design engineer in 1946 and went to Carborundum a year later, first as a project engineer, then a sales engineer. The job as assistant manager of the Mechanical Laboratory followed in 1953.



3 minutes-52 seconds, *completed from the solid*
you can cut gears 5 times faster!

You can increase production by as much as 400%.

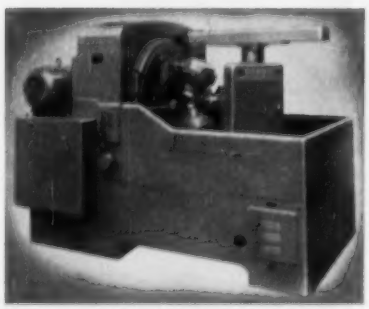
Your exact gain may vary with different gears, but in most cases this new generator will complete five gears in the time earlier models cut just one. The illustrations above show a 6 DP, 25 tooth, 7/8" face width, straight bevel gear completed from the solid blank.

The No. 104 Straight Bevel Coniflex* Generator completes each tooth in one rapid operation. A pair of multi-blade disc-type cutters combined with a cam-controlled machine cycle insures high efficiency, fine finish and maximum cutter life.

Easy to set up, the No. 104 has a wide range of capacity. You'll get the same excellent results for both small quantity jobbing work and volume production.

To discover other savings you can make with this remarkable Gleason Generator, simply write for descriptive bulletin.

*Coniflex® straight bevel gears with localized tooth bearings.



The Gleason No. 104 Straight Bevel Coniflex Generator cuts gears up to 8½" diameter, 4½" cone distance and 1⅝" face width, from 20 to 3 DP, ratios up to 10 to 1.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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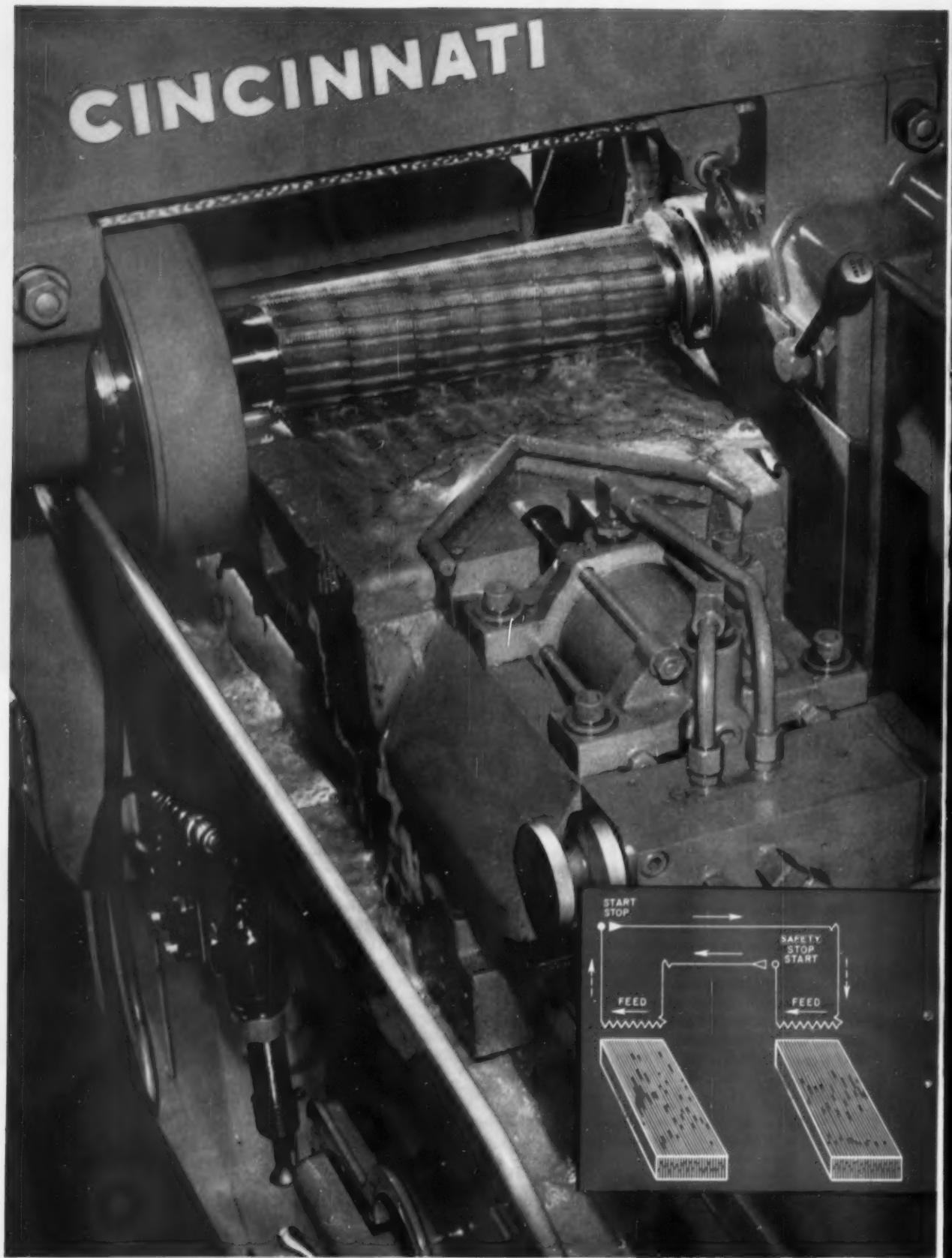
CINCINNATI
START
STOP
SAFETY
STOP
START
FEED
FEED

POWERMATIC

Lives Up To Its Name

Takes 14½" Wide Cut in One Pass

Combining a high percentage of usable power with automatic cycles is the specialty of Powermatic Milling Machines. The one illustrated here does the job to perfection for a prominent manufacturer of saw blades . . . **it takes a 10½" to 14½" wide cut in one pass, over two banks of parts, with automatic cycling of the table and spindle carrier.** ¶ This Powermatic is a plain automatic rise and fall style, 36" table traverse. Two hydraulic clamping fixtures with safety interlock, each holding 288 parts, are mounted on the table. The machine takes a "climb-milling" cut over both banks of parts, a distinct advantage in producing the same finish on all the parts. And because of the unique automatic cycle diagramed below, loading is accomplished while the milling cut proceeds. Cincinnati's exclusive Dynapoise overarm and a new type of vibration damping flywheel aid in producing a high-quality finish free of chatter and burrs.

3700 saw blades are
produced per hour
at 87% operator efficiency

You may not be interested in the production of saw blades, but you will be interested in what makes this Powermatic setup a low-cost producer for similar work in your shop. Standard features include automatic backlash eliminator; automatic spindle stop; Dynapoise overarm; cycle selectors for automatic cycles. And Cincinnati engineering service is assurance of the most economical production of your components. Would you like to know more about CINCINNATI® Powermatic Milling Machines? You will find brief specifications in Sweet's. For complete data, write for catalog No. M-1913.

THE CINCINNATI MILLING MACHINE CO.
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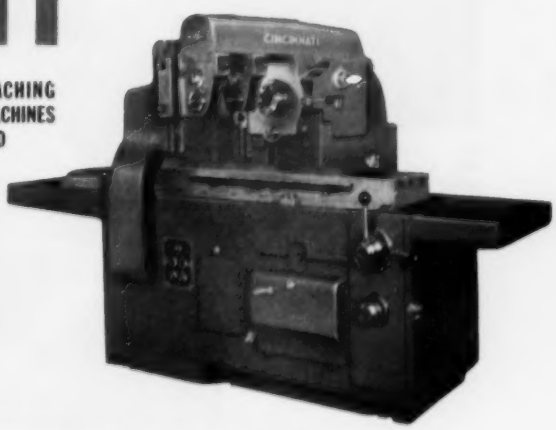
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



CINCINNATI POWERMATIC
Plain Rise and Fall Milling Machine.
Catalog No. M-1913.

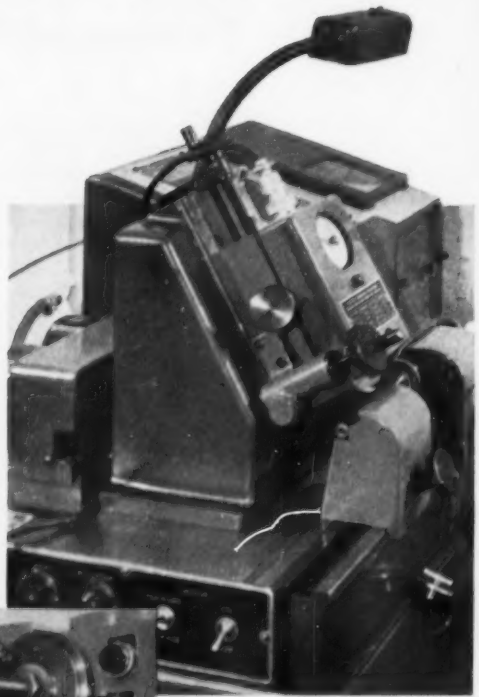
The Powermatic automatic cycle diagramed at the left combines high production with high quality to mill the teeth in 3700 hack saw blades per hour. Rear view of the machine shows its comparatively small size for this titanic job.

CINCINNATI

FELLOWS EQUIPMENT FOR FINE-PITCH

1. Gears for a major instrument maker: Fellows 3" Fine-Pitch Gear Shaper turns them out at one-third previous cost, more than twice as fast: 120 finished gears per hour, compared to old rate of 55.

2. Extra precision: Fellows No. 4 Fine-Pitch Gear Shaving Machine makes good gears better with finer finish, minimum backlash, tighter tolerances where desired.



3. Proof: Fellows No. 4 Fine-Pitch Red Liner Inspection Instrument makes a permanent, graphic record of gear quality . . . quick, efficient and accurate.

THE PRECISION LINE

GEARS

cuts production time up to 50%

at *ALLING-LANDER!*

Well known for their excellent service in producing instrument type gears of close tolerance, the Alling-Lander Company, Inc. of Sodus, New York has cut gear production time up to 50%, and unit costs more than half, by using the latest Fellows equipment in their fine-pitch gear department.

With Fellows integrated line of fine-pitch machines and inspection instruments, Alling-Lander gets high-speed production with complete control of gear quality. The Fellows 3-inch Fine-Pitch Gear Shaper is fast and accurate. Cutting speeds run up to 2000 strokes per minute and tolerances can be held to 0.0005". Close-limit tolerances are further assured by finishing on the No. 4 Fine-Pitch Gear Shaving Machine. Inspection on the No. 4 Fine-Pitch Red Liner provides chart-recorded proof of gear accuracy.

Fellows Precision Line also includes other types of gear inspection instruments and a number of models of Gear Shapers for cutting spur and helical gears of larger sizes. Your Fellows representative can give you information about any of them. And, ask him about the Fellows Plan for deferred payment too. Write, wire or phone any of our offices.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2
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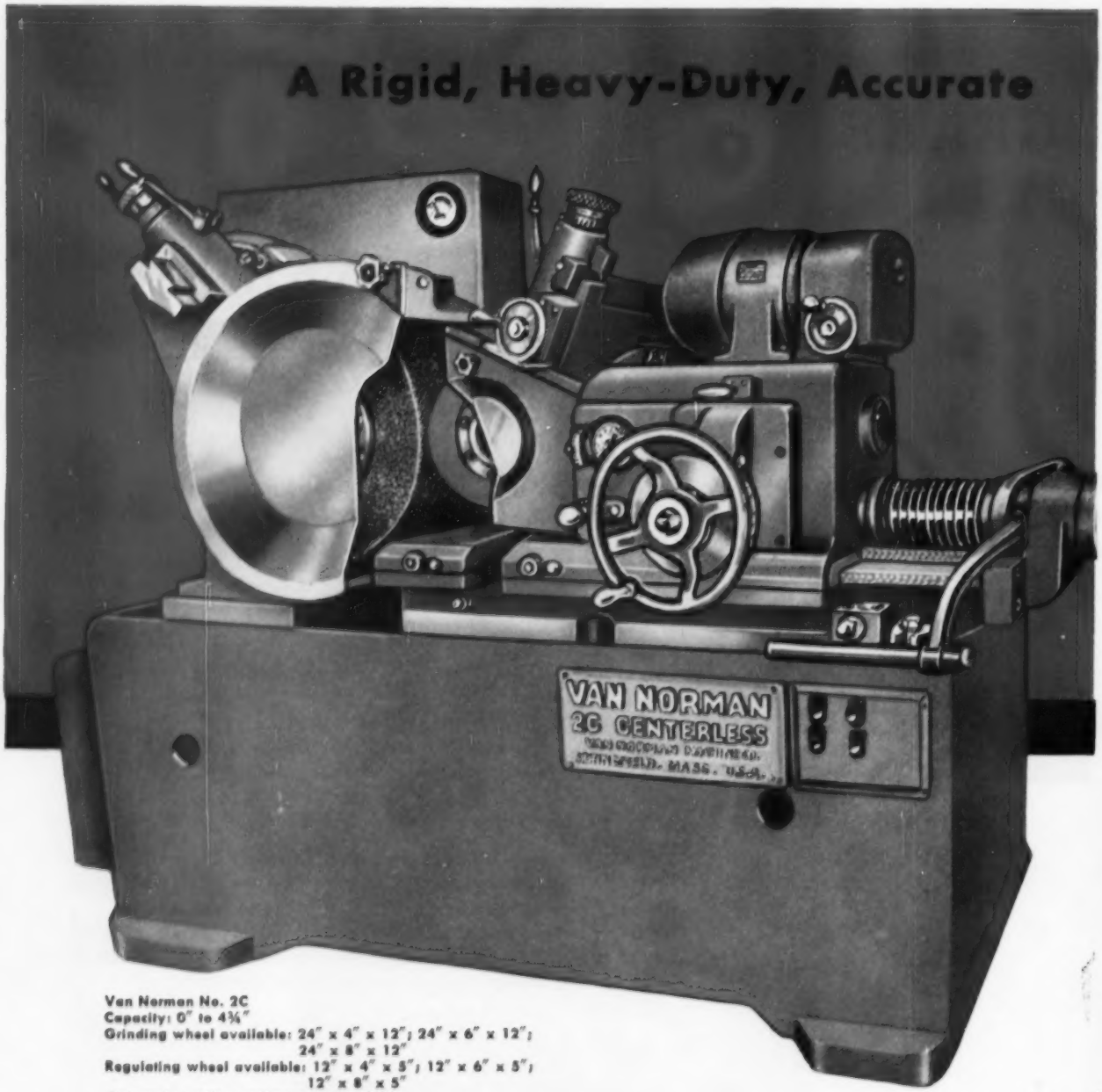
Fellows *Gear Production Equipment*

Introducing The VAN NORMAN



Van Norman No. 2C
Capacity: 0" to 4¼"
Grinding wheel available: 24" x 4" x 12"; 24" x 6" x 12"; 24" x 8" x 12"
Regulating wheel available: 12" x 4" x 5"; 12" x 6" x 5"; 12" x 8" x 5"
Automatic cycling and gauging available.

**Don't wait . . . for extra profits install a Van Norman Machine now!*
They are available on many purchase plans — Outright sale . . .
Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . .*
See your dealer or write Van Norman Company
Conditional Sales Contracts not available to Export.

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

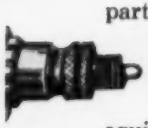
No. 2C Centerless Grinder

Machine with Work Capacity 0" to 4¾"

Precision Grinds Parts Fast . . . Holds Tolerances . . . Cuts Grinding Costs

Newest in the expanding line of Van Norman grinders, is the No. 2C Centerless Grinder. This rugged, precision-built, heavy-duty grinder incorporates many outstanding, exclusive advantages that result in more work per operator, per work shift.

The No. 2C Centerless Grinder finish grinds many parts from solid . . . or finish grinds rough-turned parts. The No. 2C gives you the facilities of three centerless grinders without change-over time . . . standard grinding for throughfeed work, standard grinding for infeed jobs, and equipped with crush dressing attachment, it form grinds and does profile work.



Phone, wire or write for full details on the New Van Norman No. 2C Centerless Grinder, today.

Outstanding Advantages

Hard chrome plating of regulating wheel slide after hand scraping, preserves original factory built-in accuracy.

Grinding wheel spindle is of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life, assuring chatterless troublefree operation.

Spindle requires no warm-up period, eliminating "creep" which has always been a problem in grinding operations.

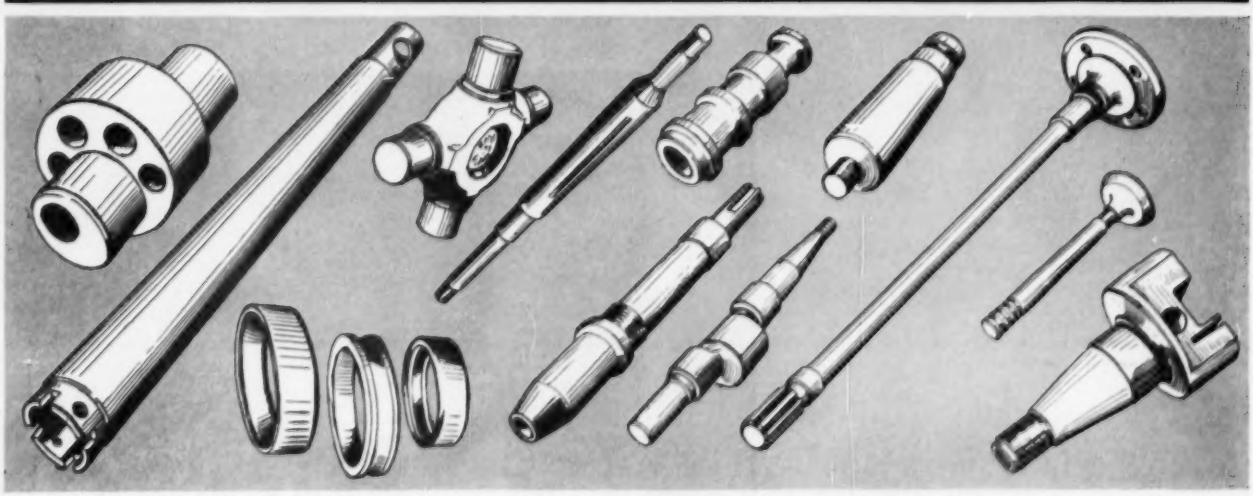
Infinitely variable regulating wheel drive.

Totally enclosed fan cooled, dynamically balanced 15HP main drive.

Independent hydraulic wheel truing devices for each wheel.

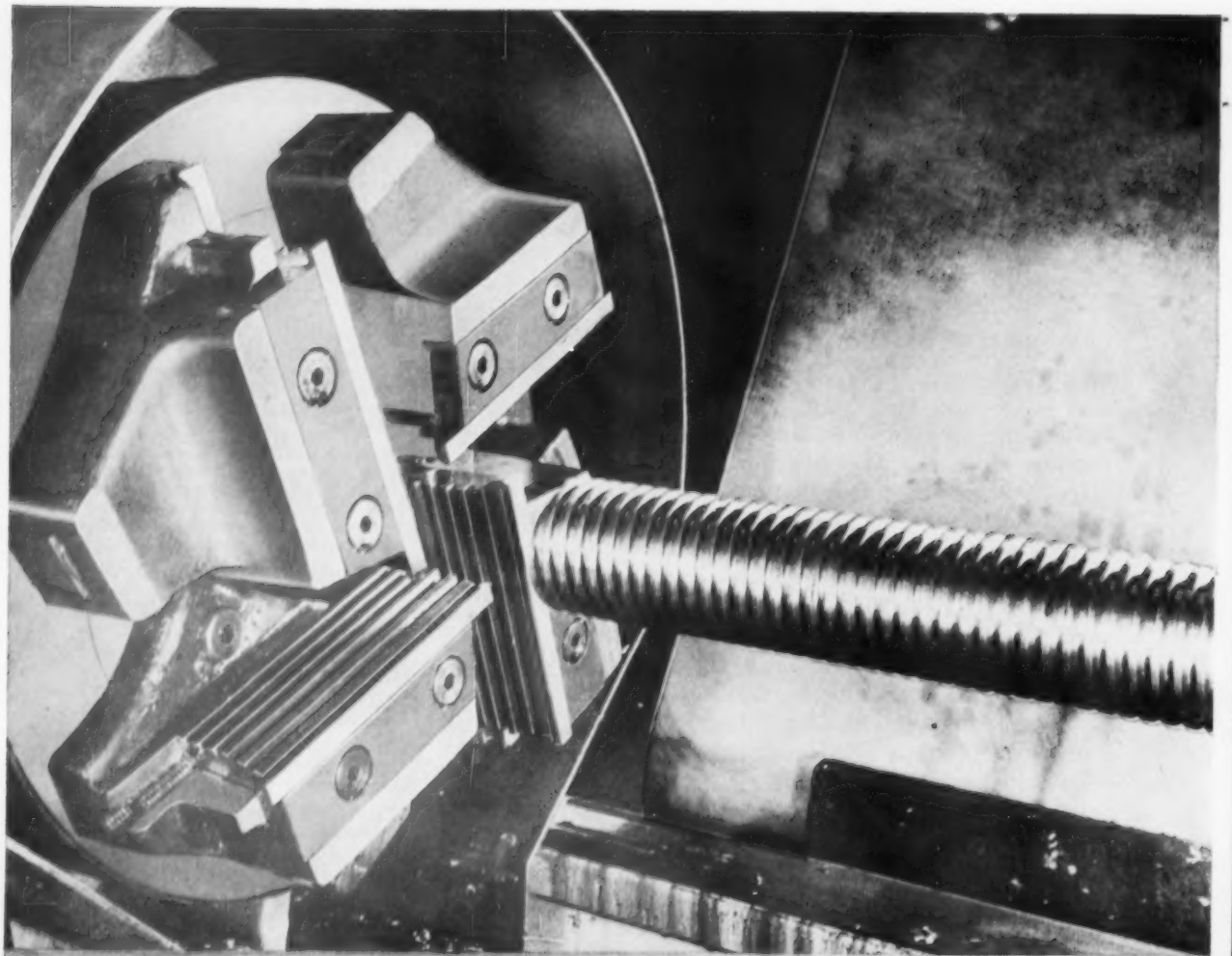
Fine hand wheel adjustment on diameter of work piece.

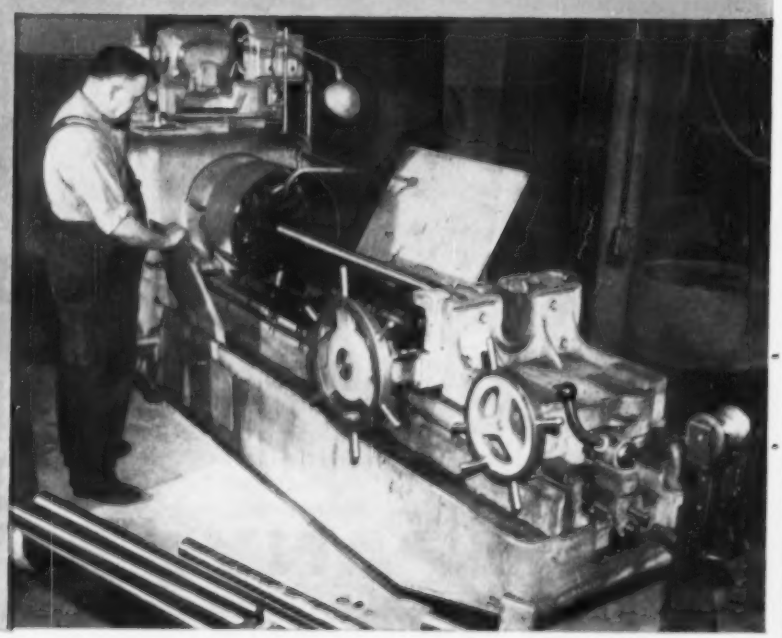
Grind Parts Like These Accurately, More Economically



COMPANY

SPRINGFIELD 7, MASSACHUSETTS





90%

threading time saved

on power screws

This large saving in the production of power screws at Rodney Hunt Machine Co. (Orange, Mass.) was made possible by the use of a LANDMACO Threading Machine.

Specifications require $2\frac{3}{4}$" diameter—$2\frac{1}{2}$ pitch Acme threads 56" long on cold-rolled steel. 5 hours had previously been required to complete the thread. Floor-to-floor threading time was cut to only 30 minutes after the installation of a LANDMACO 32C Single-Spindle Machine with a special 60" carriage travel.

Many features in the design of this equipment make it possible to do heavy duty threading to precision tolerances. Heavy construction and leadscrew feed assure accurate threading. Slippage of the work is prevented by an improved carriage front with 60% greater gripping power.

Massive construction of the 4" LANCO head and chaser-holders give maximum support to the chasers for the largest or smallest diameters. The tangential design of the chasers provides lateral absorption of cutting strains and free cutting action. Their roughing-and-finishing form assures threads of excellent finish in one pass, and the centering throats eliminate the out-of-roundness common in long workpieces.

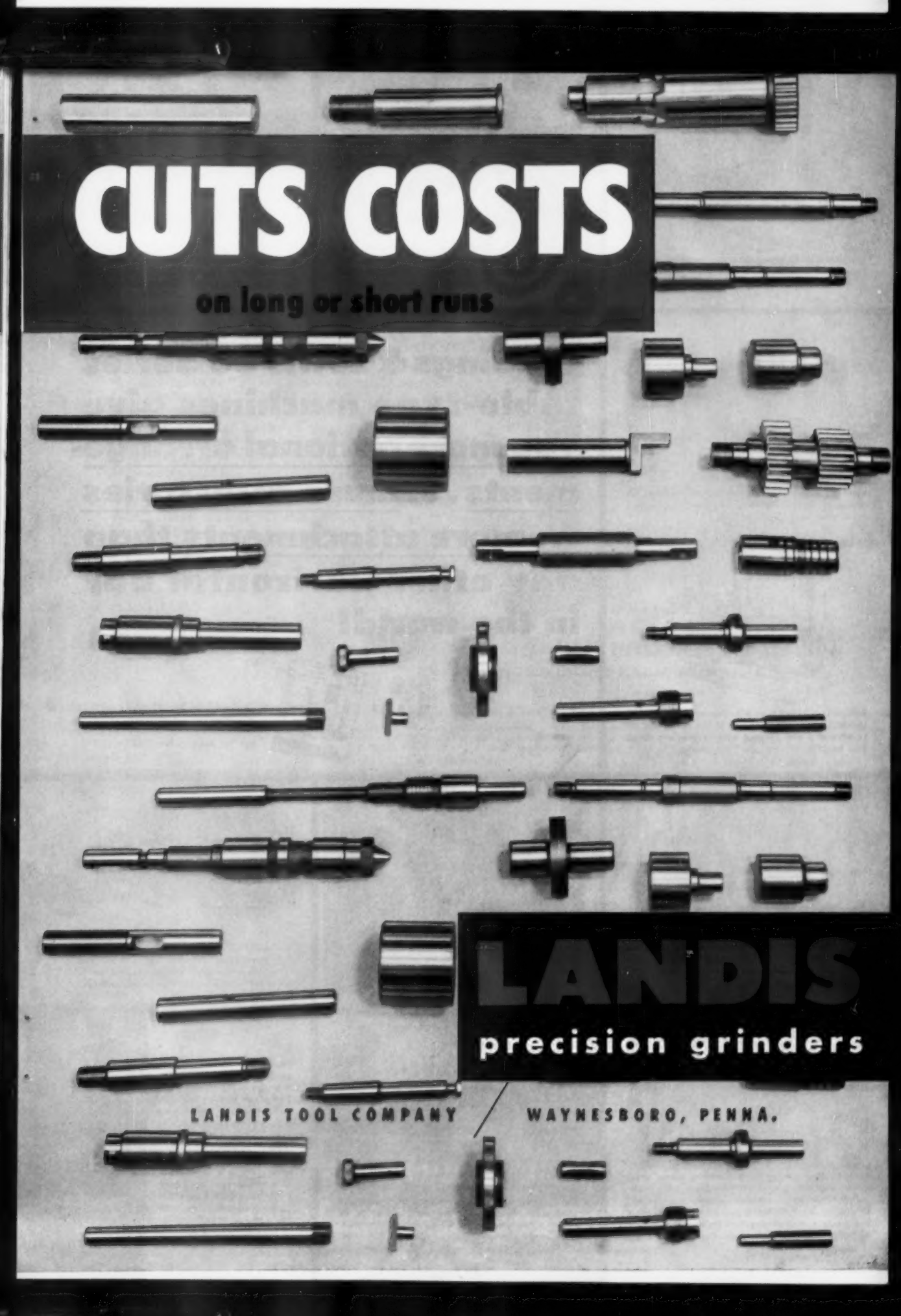
This is but one example of the production economies to be derived from using LANDIS Equipment on large diameter threading. For additional information, please send specifications and ask for Bulletin #*H-45*.

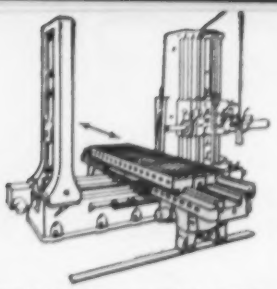
The World's Largest Manufacturer of Threading Equipment — Cutting - Tapping - Grinding - Rolling

LANDIS *Machine* COMPANY

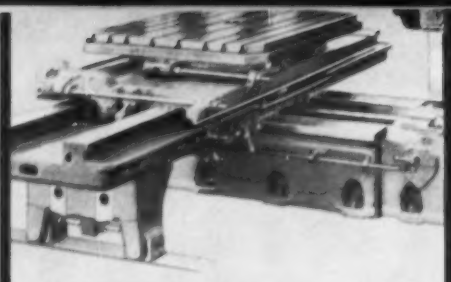
411-C WAYNESBORO • PENNSYLVANIA • U.S.A.

4" Landis Plain Grinder

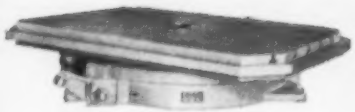

CUTS COSTS
on long or short runs
LANDIS
precision grinders
LANDIS TOOL COMPANY
WAYNESBORO, PENNA.



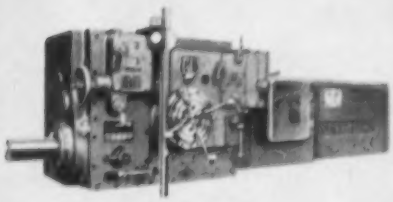
Increased table sizes, extended saddles, saddle supports and auxiliary runways — foundations in-the-floor or over-the-floor types.



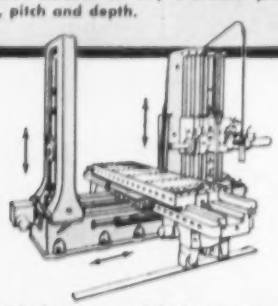
Built-in rotary tables with power milling feeds available with round, square or rectangular platens in various sizes.



Auxiliary combination plain and hand feed rotary tables available with round, square or rectangular platens in various sizes.



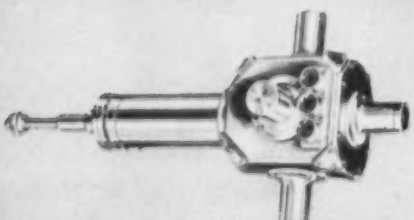
Built-in thread lead device permits cutting of precision threads to any standard prescribed form, pitch and depth.



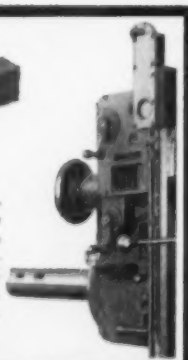
Full ribbed column and bed assures maximum rigidity. Machines available in various increased column and end support heights plus increased bed lengths.

Giddings & Lewis 30 Series table-type machines give you more optional arrangements . . . more accessories . . . more attachments than any other horizontal bar in the world!

• For complete specifications on G&L 30 Series Table-Type Horizontal Boring, Drilling and Milling machines ask for Bulletin No. 345.

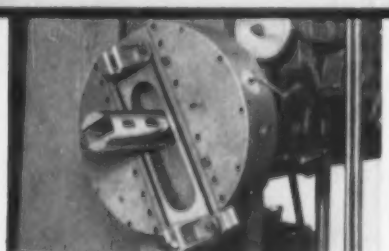


Super-sensitive Dupli-TRACER assures accurate 2- or 3-dimensional stepless contour tracing and 360° profiling. Another important feature is a manual steering control.

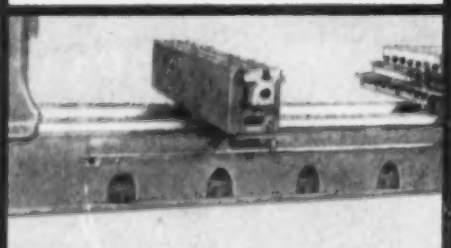


Automatic, electrically-operated positioning device for both headstock and table travel assures accurate machine settings repetitive to .0002" . . . eliminates time-consuming fine hand adjustments.

Heavy-duty, single-spindle, angular milling attachment operates at right angles to machine spindle. Offers unusual flexibility for machining hard-to-reach surfaces.

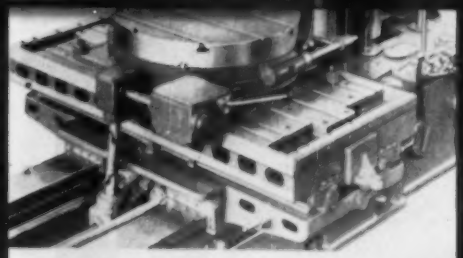


Continuous feed facing and boring heads used either separately or in combination with other attachments or accessories for turning, facing, threading, back facing, grooving, etc. Telescopic, right angle and facing tool holders, and high speed grinder are also available.

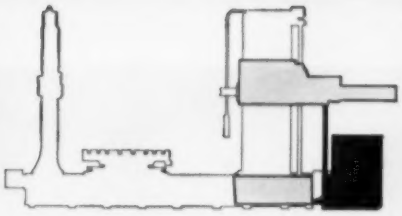


Plain or sliding platen auxiliary tables, mounted between table and end support, add extra rigidity in machining long workpieces which overhang the width of table.

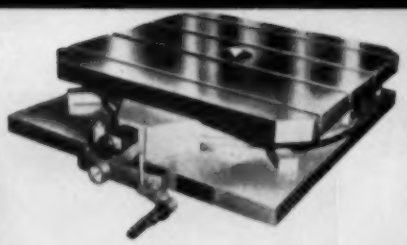
Improved measure device, used in conjunction with precison end measure rods (complete sets or individual units) is employed where extreme accuracy is required — readings to .0001". Device includes vertical and horizontal measuring unit to indicate vertical travel of headstock . . . cross travel of table on saddle . . . also for transverse saddle movement.



Auxiliary combination plain, hand and power take-off feed rotary tables available with round, square and rectangular platens in various sizes.



The exclusive G&L "Lubri-Cool" system, shown connected to headstock and milling feed unit, assures machining accuracy under heavy loads and in ambient temperatures.

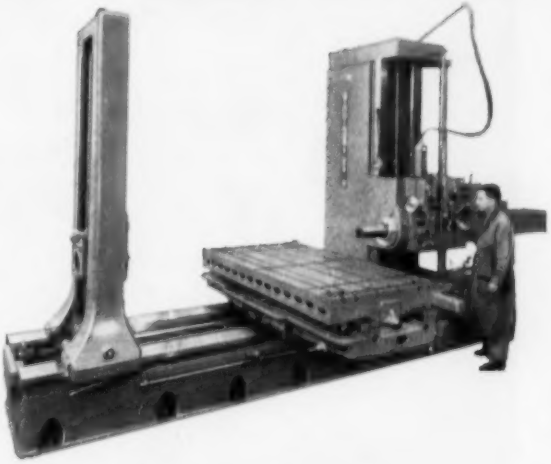


New G&L Air-Lift rotary table literally "floats on air." Capable of 360° indexing off center loads . . . eliminates multiple setups. Available with round, square or rectangular platens.

Here's why the world's favorite, profit-making Horizontal Boring, Drilling and Milling machines are Giddings & Lewis 30 Series, table-types — Model 340-T with 4" dia. spindle (20-hp motor) and Model 350-T with 5" dia. spindle (25-hp motor). It's because of their ability to be adapted to handle an extremely broad range of work when equipped with any of a big variety of optional equipment, attachments and accessories.

Year in and year out these machines continue to offer you more new features — such as the exclusive "Lubri-Cool" system. You'll discover too, that no other machine on the market today offers you so many distinct performance and capacity boosting features for boring, drilling and milling.

Yes, there's no better time than now to find out how much more work these machines can do in your shop. Contact your Giddings & Lewis representative today. He'll be glad to give you all the facts.

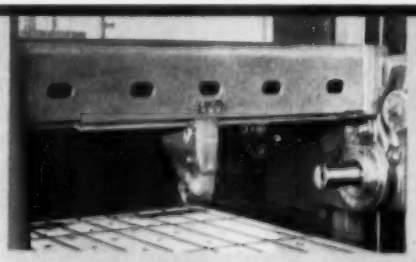


G-58

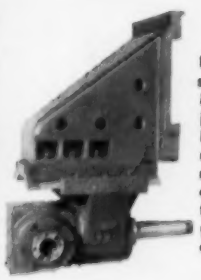
G&L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; Vertical Turret Lathes; Spar and Skin Milling Machines, and VARIAX machines.

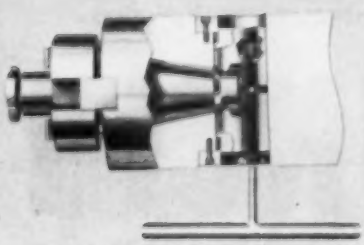
Heavy-duty, two-spindle angular milling attachment handles heavy cuts with high power outer spindle. Medium-duty inner spindle used for a wide range of drilling, boring, light milling and other work.



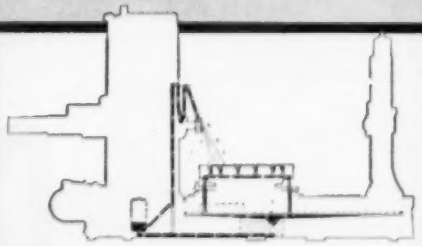
Cross-rail type arbor support in various lengths permits setting of milling cutters at any position over the table. It's ideal for slab, gang and straddle milling operation.



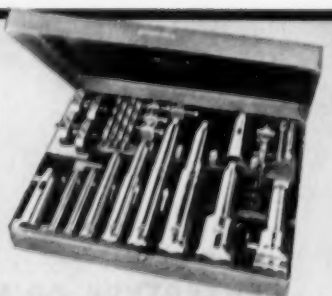
Right angle, heavy-duty sliding-head angular milling attachment with adjustable overarm support is practical for heavy milling, boring, drilling, reaming, etc. Medium-duty unit also available for machining at any angle in large openings and cavities.



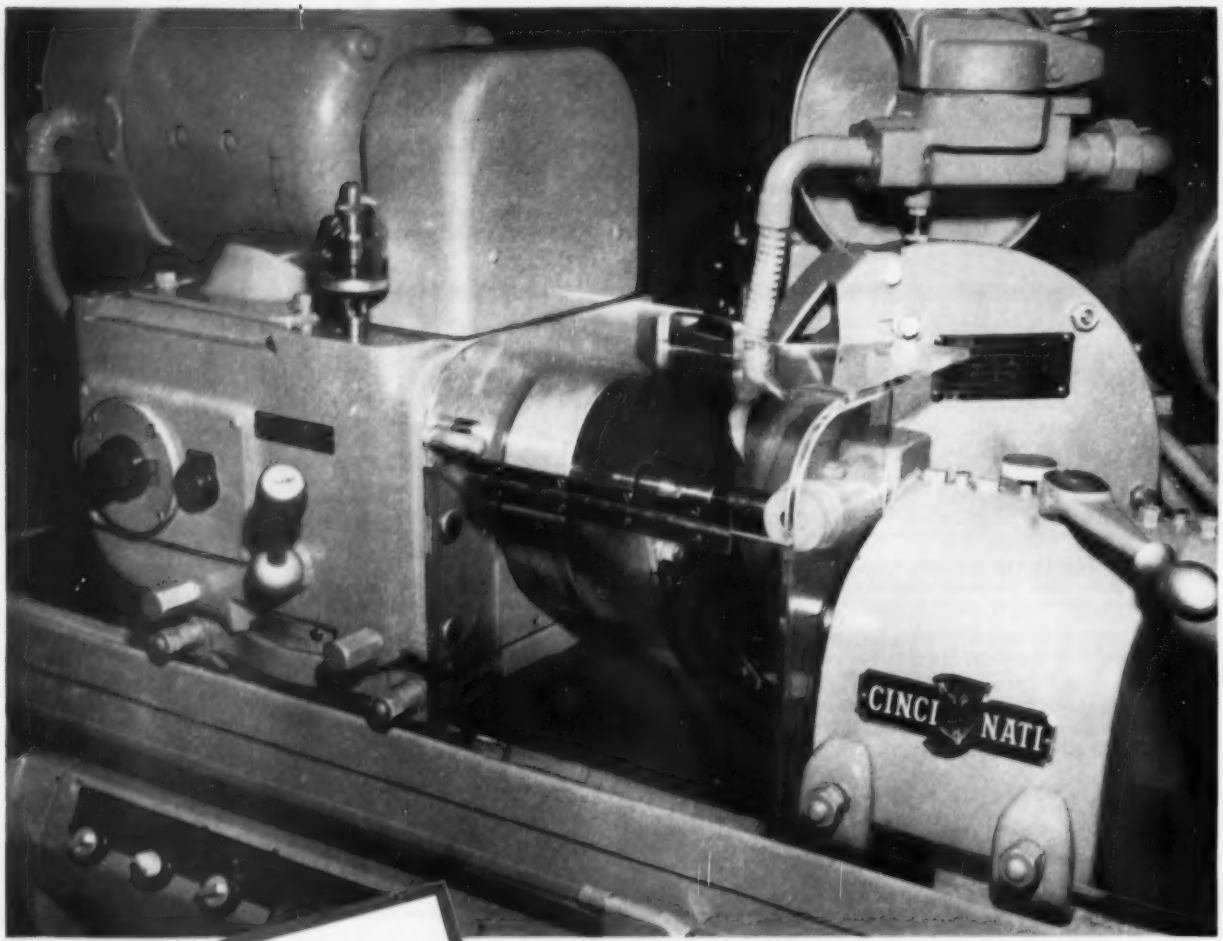
Optional Quick-Change or Morse taper spindles available. Quick-Change spindle positively retains or ejects cutting tools by means of a simple wrench adjustment.



High volume coolant system on 30 Series machines assures an adequate supply of coolant to cutting tool. Table tee-slots are closed at the ends . . . table and saddle drilled allowing coolant to pass into a trough attached to bed of machine. Coolant tank is cast in the bed, or optional tank may be installed in floor.



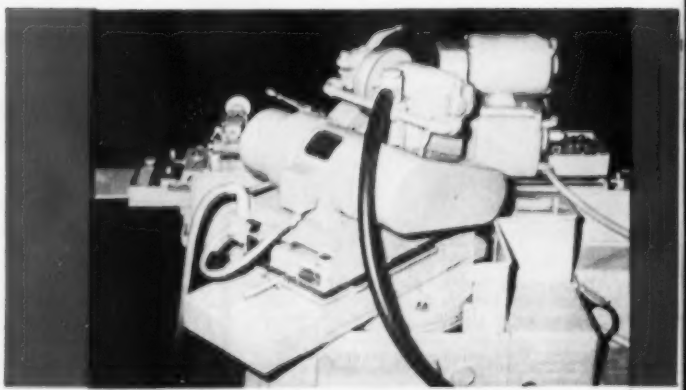
Davis Super Micrometer Stub Boring Tools, available in complete sets, speed boring in production and tool room work. Line bars with block type or micrometer expansion tools also available.



CINCINNATI FILMATIC 10″ UNIVERSAL GRINDER

set up to grind simultaneously diameter and shoulder of titanium trip dogs. Wheel runs at 5000 fpm for these titanium parts.

FILMATIC



Double end motor and standard wheelhead swivel are shown to advantage in this view.

CINCIN

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

This Universal Grinder Gives You Both

Versatility and Production

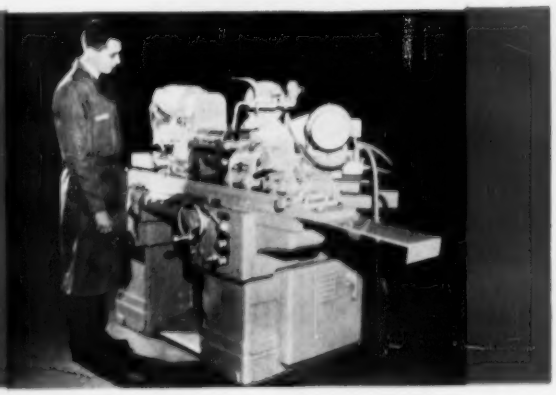
Look at your universal grinders from this viewpoint: can they handle an occasional high production job at a reasonable cost? It's routine work for the CINCINNATI® FILMATIC 10" Universal illustrated here . . . grinding the diameter and shoulder on large quantities of small titanium parts. ¶ To obtain the highest quality finish on the two surfaces, the grinding wheel has been transferred to the right-hand end of the spindle, and the wheelhead swiveled about 45°. Built-in automatic infeed equipment aids the operator in maintaining a uniformly high rate of production. An angular truing fixture simplifies the truing and dressing chore. The 10" Universal's extra measure of power is a big factor in production, too. Consider these items compared to other machines in its class:

- Largest grinding wheel; 12" dia. x 1½" face
- Most powerful wheelhead motor; 2 hp
- 50% larger headstock motor
- Exclusive FILMATIC grinding wheel spindle bearings

In addition to all these production advantages working for you on the occasional high production job, the CINCINNATI FILMATIC is a true universal. Wheelhead swivels 180° and 220°, upper and lower, respectively; headstock swivels 180°; headstock speeds are infinitely variable 60 to 600 rpm. Sounds good for your shop, doesn't it? Sweet's Machine Tool File contains brief specs.; for complete data, write for our catalog G-577-5.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Angular wheel truing attachment for truing and dressing two grinding surfaces on wheel.



CINCINNATI FILMATIC 10" Universal Grinding Machine. Complete information in catalog No. G-577-5.

NATI

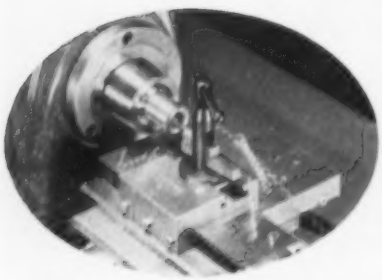
CINCINNATI

CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

HARDINGE
ELMIRA, N.Y.

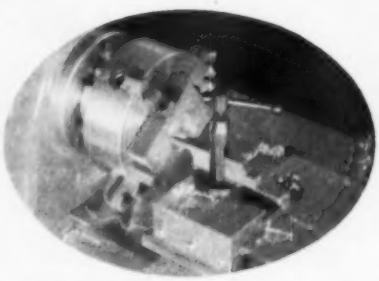
HIGH SPEED PRECISION LATHE

Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of one-inch or less diameter.

Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1" Collet Capacity
9" Swing
17" Center Distance
8 Speeds to 4000 rpm.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

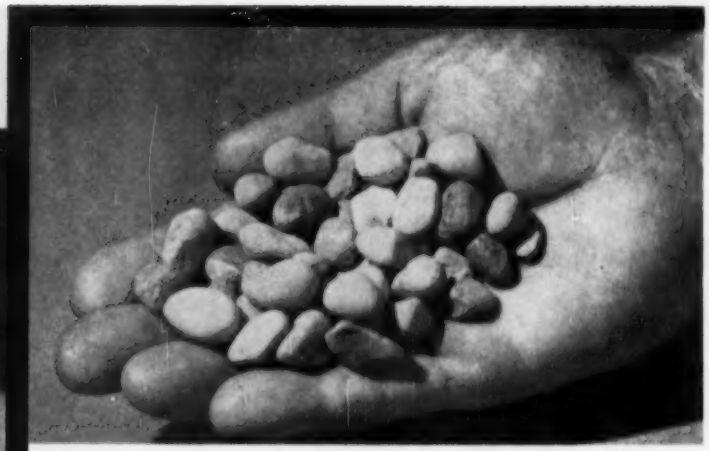
Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

ALUNDUM* TUMBLEX "A" ABRASIVE, for general barrel finishing. Can perform several operations in one: removes flash, heat treat scale, tool marks, deburrs, forms radii, and finishes to desired microinch. Available in eleven sizes.



TUMBLEX "N" ABRASIVE, for high lustre, especially on die castings and soft metal. Rounded uniform shape brings out the most desirable color of the finished parts. Available in seven sizes.

ALUNDUM TUMBLEX "T", a bonded, triangular shape, fast cutting tumbling abrasive for special shaped parts. The triangular shape prevents wedging in work slots or holes. Available in four sizes.

Barrel finishing is producing sensational results

...and 3 Norton TUMBLEX Abrasives lead you to the best method

Here are three steps that may yield some interesting advantages to you.

First, check your present method of deburring and descaling. If it is slow and costly, it is quite likely that barrel finishing can do it better, faster and cheaper.

Second, check the three Norton Tumblex materials shown above and decide if their properties would be suitable for your requirements.

Third, send us some work samples with a description of the results wanted — and include a finished piece. We will tumble the samples and return to you with full information covering the material and method used. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., a division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-308

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products...
to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones Pressure-Sensitive Tapes

Backbone for any job...

New Kearney & Trecker TF Series milling machines have it . . . backbone for the precise tool room job and "plenty of beef" for rugged duty milling

TF Series
Model 210 Plain Milling Machine

POWER — 10hp spindle drive; 3hp feed and rapid traverse drive
TABLE WORKING SURFACE — 62" x 14"
FEEDS — (32) ⅜ to 90 ipm
SPEEDS — (24) 15 to 1500 rpm
WEIGHT — 9200 lbs.

New TF Series milling machines are available under Tool-Lease program

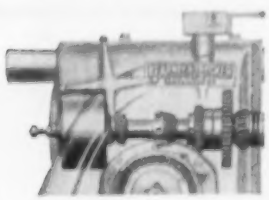
THE solid-back column is an outstanding example of Kearney & Trecker advanced engineering. This one-piece, cross-ribbed, solid-back column is the most important single element of the machine. Every inch of metal is scientifically distributed to add rigidity where it's needed the most. Thus the column readily absorbs all the heavy work loads supported by the heavier, wider knee, and also all torsional thrusts to the cutter transmitted through the heavy-duty, three-bearing spindle and double overarms.

What's more, the heavier column base is specially designed for the new, exclusive twin screw knee support — the only balanced-design arrangement offered today.

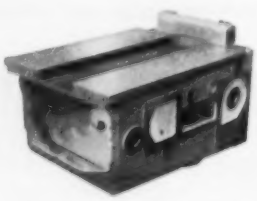
In addition, the new TF's give you other outstanding design and operating features, never before available on any knee-type milling machines. They're built in five sizes — No. 2 to No. 6 from 10hp to 50hp in Plain, Universal and Vertical styles.

For facts and figures that will help you — ask about TF's — the latest in milling machines. Contact your Kearney & Trecker representative — call him or mail coupon direct to factory today.

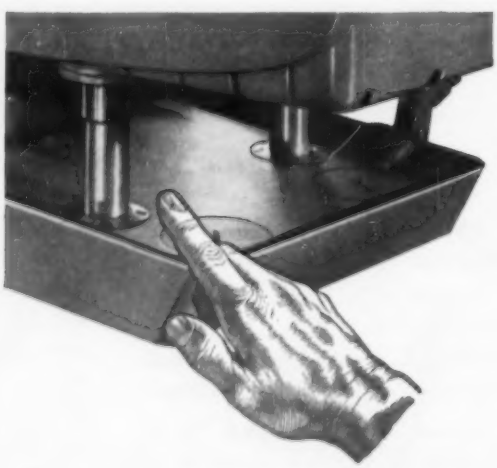
A few more of many reasons why TF Series milling machines are way out front in rigidity



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life . . . excellent finish . . . quieter and vibrationless operation.



Heavier, Wider, One-Piece Knee — The twin screw arrangement supports the heavier, larger knee. Span and length of ways are increased considerably, providing fuller saddle support . . . long-lasting accuracy.



Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of new machines' much larger, wider, heavier knee, saddle and table. This balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . halves the wear factor, assuring greater, longer-lasting accuracy.

KEARNEY & TRECKER CORP.
6786 W. National Ave., Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on the new line of TF Series Plain, Universal and Vertical milling machines.

Name .....

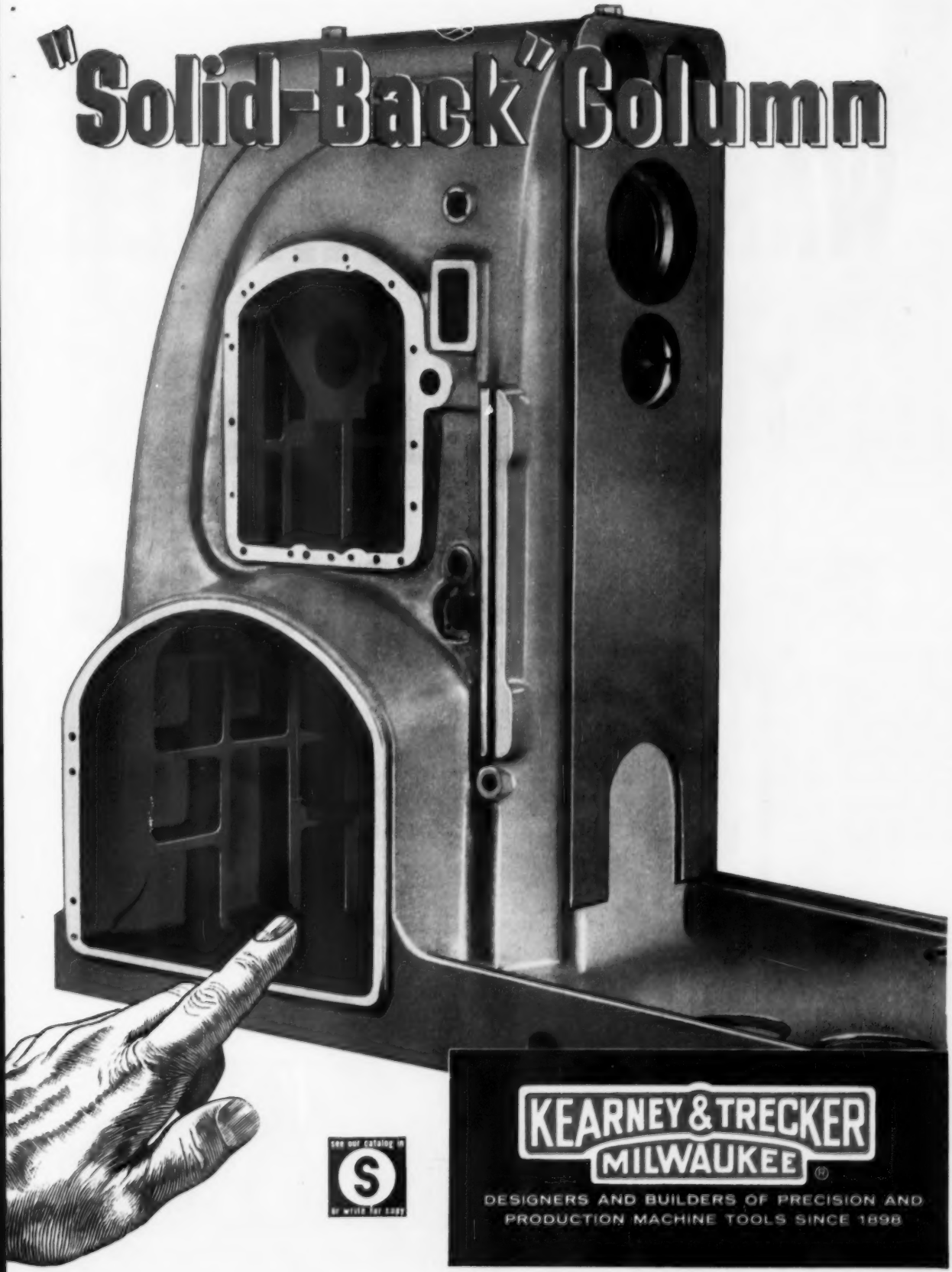
Title .....

Company .....

Address .....

City ..... Zone ..... State .....

"Solid-Back" Column

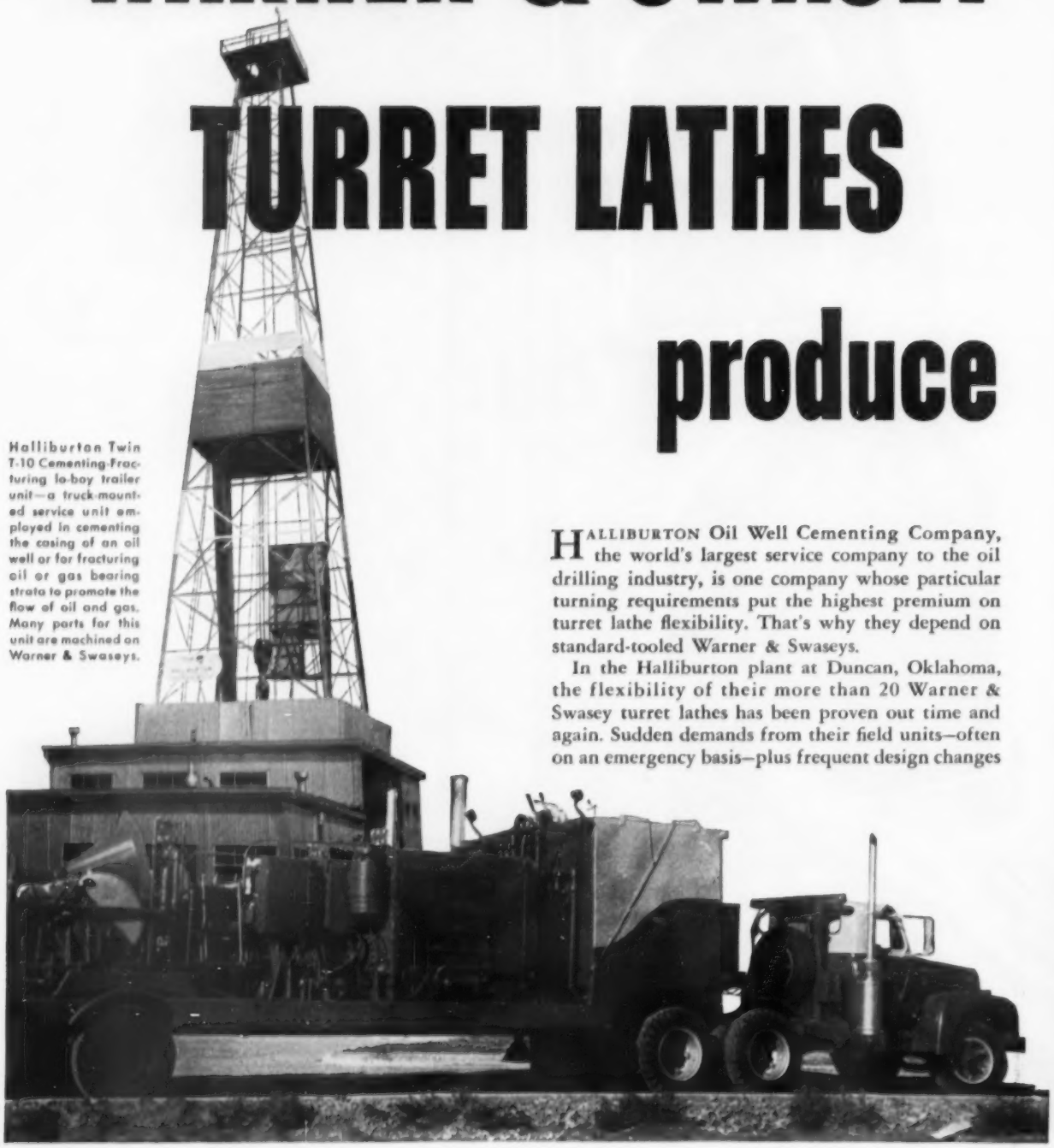


see our catalog in S or write for copy

KEARNEY & TRECKER MILWAUKEE

DESIGNERS AND BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

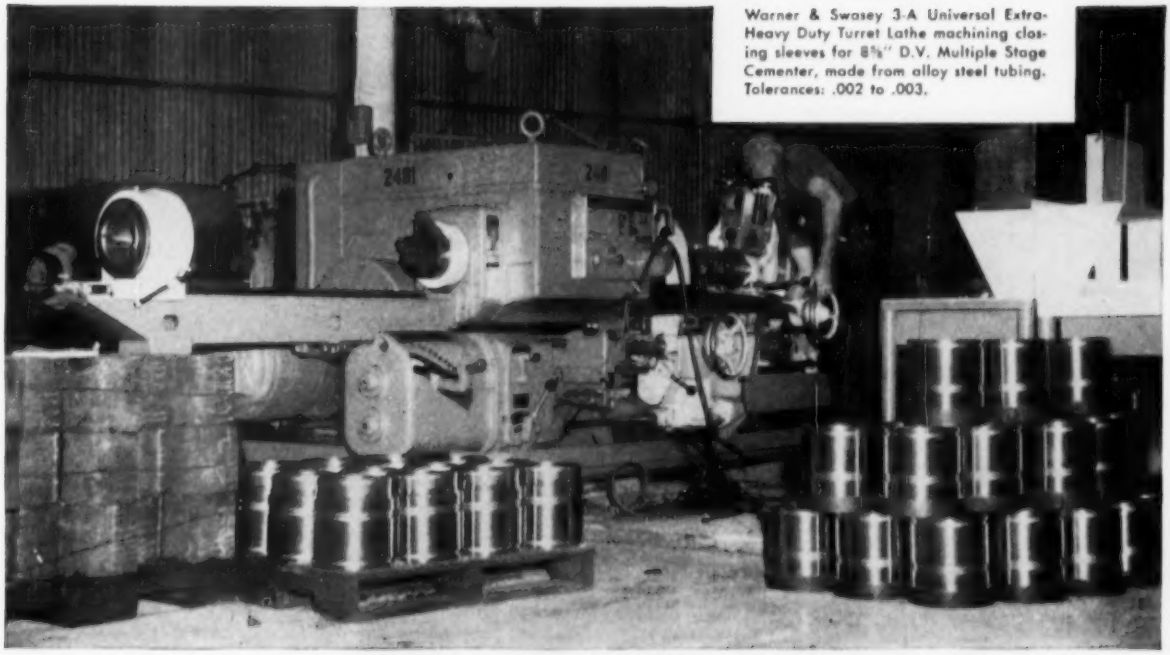
WARNER & SWASEY TURRET LATHES produce



Halliburton Twin T-10 Cementing-Fracturing lo-boy trailer unit—a truck-mounted service unit employed in cementing the casing of an oil well or for fracturing oil or gas bearing strata to promote the flow of oil and gas. Many parts for this unit are machined on Warner & Swaseys.

HALLIBURTON Oil Well Cementing Company, the world's largest service company to the oil drilling industry, is one company whose particular turning requirements put the highest premium on turret lathe flexibility. That's why they depend on standard-tooled Warner & Swaseys.

In the Halliburton plant at Duncan, Oklahoma, the flexibility of their more than 20 Warner & Swasey turret lathes has been proven out time and again. Sudden demands from their field units—often on an emergency basis—plus frequent design changes



Warner & Swasey 3-A Universal Extra-Heavy Duty Turret Lathe machining closing sleeves for 8⅝" D.V. Multiple Stage Cementer, made from alloy steel tubing. Tolerances: .002 to .003.

results at Halliburton

for their equipment, puts the flexibility of these turret lathes and their standard tooling to a real test. The Warner & Swaseys have met these demands—turning out the variety of small lots, holding required close tolerances and finishes, and producing at low cost with the very minimum of downtime.

It is significant that the growth of this company has been paralleled by ever-increasing numbers of Warner & Swasey turret lathes in the Halliburton plant. Since the first installation in 1934, they have looked to Warner & Swasey to meet their peculiar turning requirements. An important part of this long-standing business relationship is the prompt service and sound tooling advice provided by their Warner & Swasey Field Representative—service that is available nation-wide.

Filling the specialized turning requirements of machine tool users—plus the more usual machine shop applications—is our job. Our nearest Field Representative will be glad to work with you to fill your needs. He'll recommend the right machine, with proper tooling, to most efficiently handle your work. Call him in!

You can produce it better,

faster, for less

...with a WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

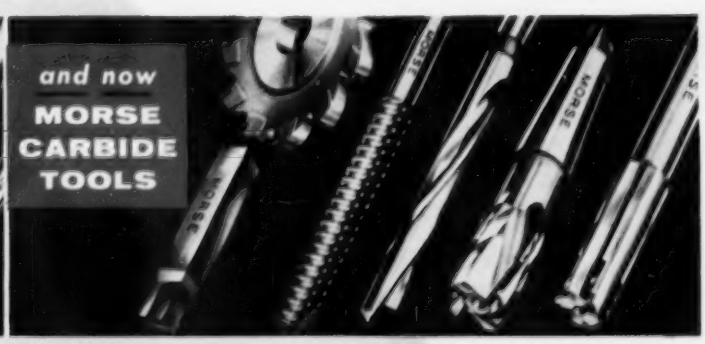
In your
MORSE-
FRANCHISED
DISTRIBUTOR
MORSE
COBALT
TOOLS

territory and any territory...

the top **ISD**
(the man we deal with exclusively)

is the **MFD**
(your Morse-Franchised Distributor the man with "The Most")

Here's why **MORSE**
means **"THE MOST"**
(World's Most Complete Line of Finest Quality Tests)



MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.
(Subsidiary of VAN NORMAN INDUSTRIES, INC.)

Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

FOR STATIONARY GAS TURBINE

in machining...

WHAT'S YOUR SCRAP RATE

...3%?...5%?...10%?

LAPOINTE

the only scrap in BROACHING is the chips!

It may seem naive to remind you that *all the machining skill* is engineered right into the broach itself, and therefore you get *no rejects* when broaching by Lapointe! Lapointe Broaching is the *one way* to obtain repetitive accuracy to close tolerances, *at a high production rate.* (You can't get this with any other machining method.)

So if you want to reduce your scrap pile, we recommend that you think seriously of converting some of your operations to Lapointe Broaching. We can help you in this connection, because we are known as "Broaching Headquarters" — the oldest and largest company in the business! Another reassuring fact: We can take the responsibility for your complete broaching problem . . . we build the broaching machines, build the broaching fixtures, and make the broaches!

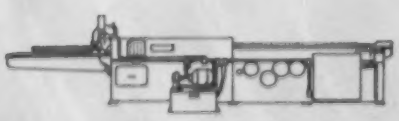
We'll answer your inquiry promptly.

THE LAPOINTE MACHINE TOOL COMPANY

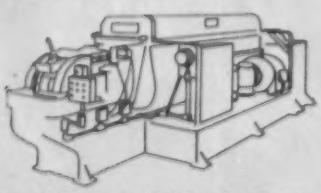
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

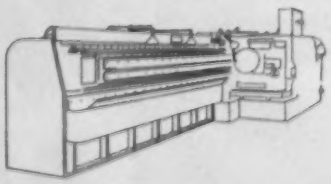
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

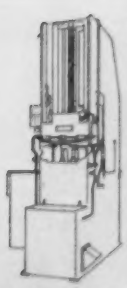
Made from steel of our own specifications, and ground by expert operators to designs conceived by our capable broach-conscious engineers, it is only natural that LAPOINTE-made BROACHES are at the pinnacle of the broach-maker's art

FOR AIRCRAFT GAS TURBINE

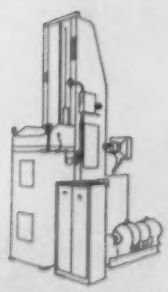
Lapointe pioneered the design and development of the now-famous "pine tree" broach, and is still far in the lead in producing all types of broaches for jet engines, and for turbines. We make broaches of every type: carbide-tooth, splines, rounds, flats, rectangular.

BROACH SHARPENER

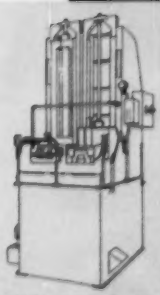
This efficient LAPOINTE machine for sharpening broaches is built in 3 sizes: 60", 72" and 80" capacity between centers. A different model, 36" size, is designed for sharpening small surface broaches. Literature available.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

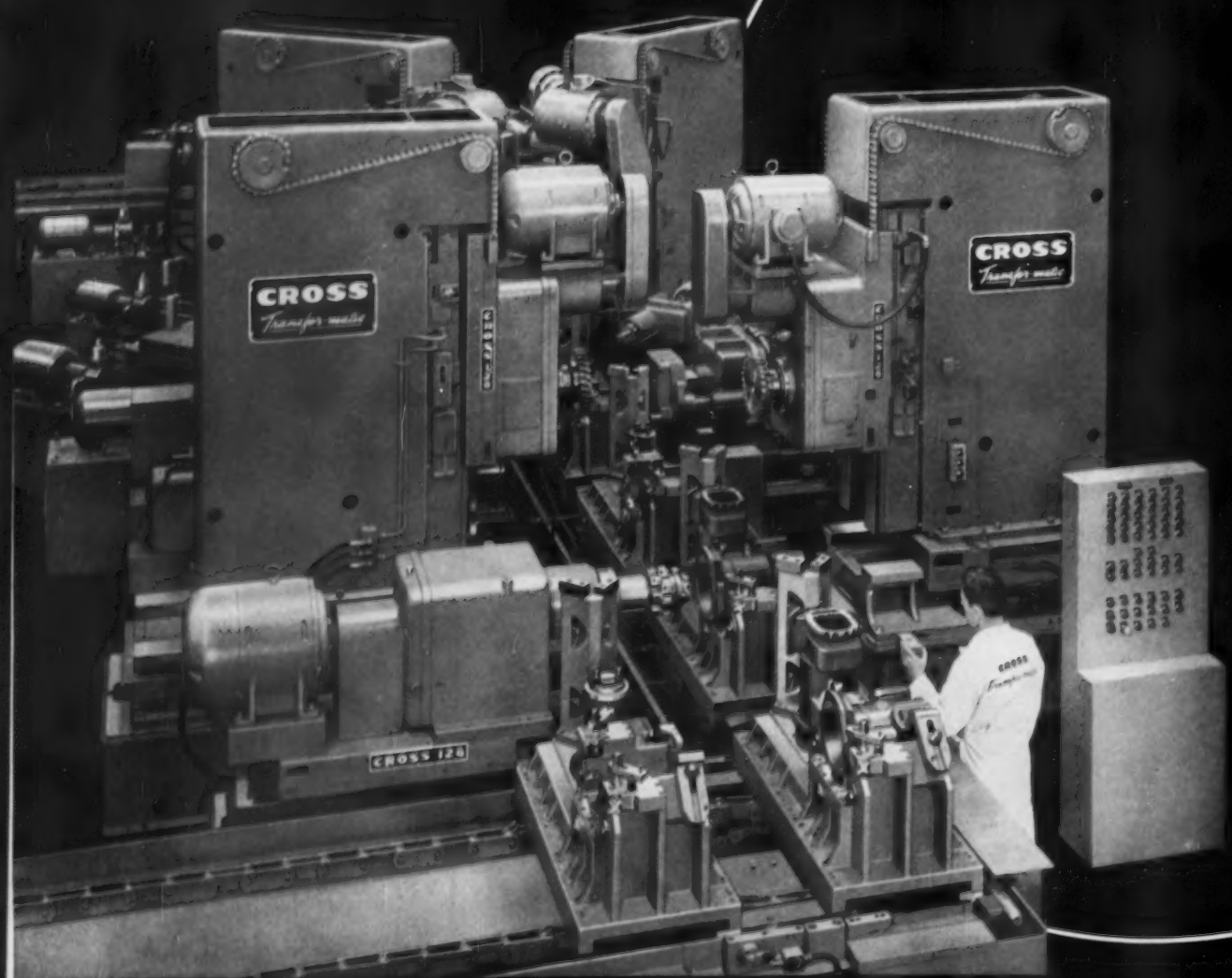
known to be the best in

BROACHING

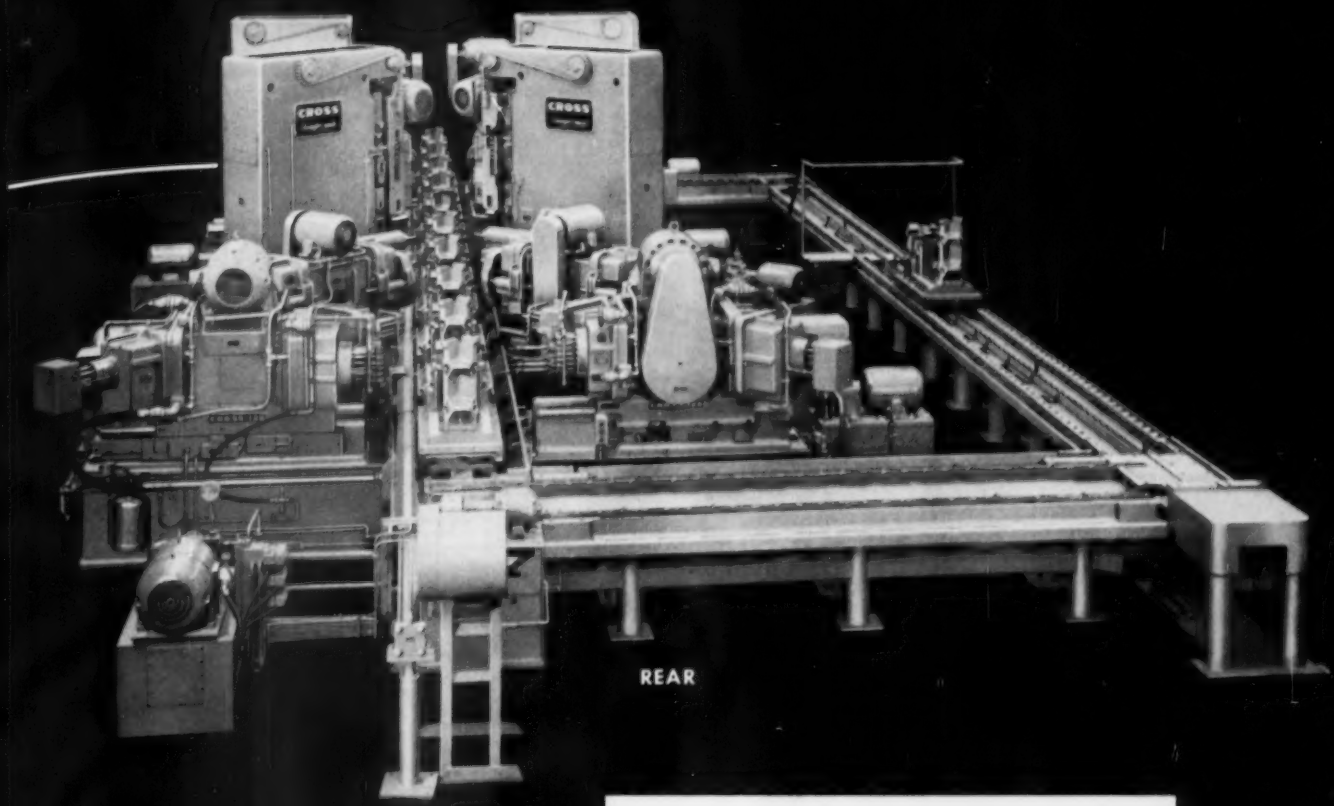
Completely Machines Air Conditioning Housings

(from Rough Castings to Assembly)

Another Transfer-matic by Cross



OPERATOR'S STATION



REAR

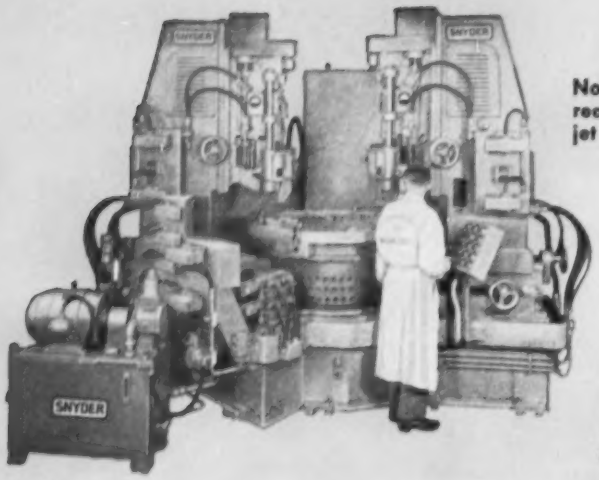
- ★ 18 pieces per hour at 100% efficiency.
- ★ 159 operations: 6 milling, 6 boring, 1 facing, 81 drilling and 65 tapping.
- ★ Two-position, progressive type, palletized work holding fixtures for carrying the parts from station to station.
- ★ Modular unit construction provides flexibility for part design changes.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping; automatic lubrication; automatic chip conveyor.

Established 1898

THE CROSS CO.

First in Automation

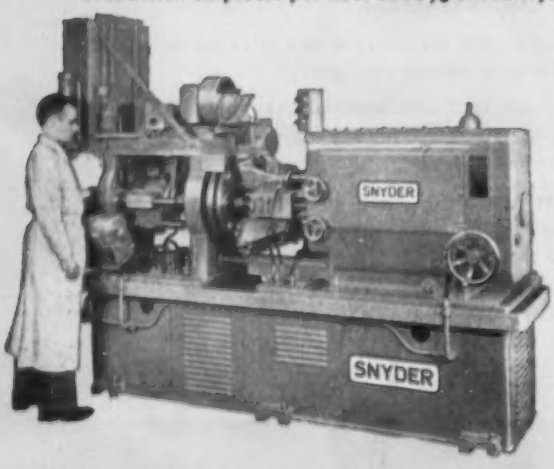
DETROIT 7, MICHIGAN



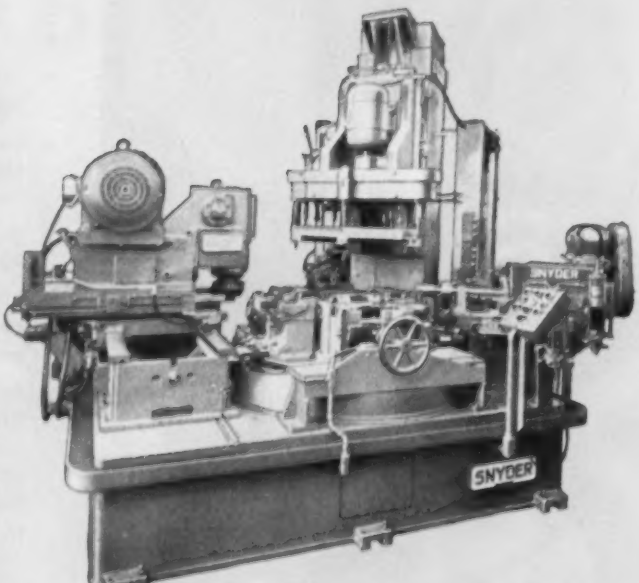
No. 70165—Special index machine to drill and ream holes in rims of outer shroud spacers for jet engines. Production 2 parts per hour.

No. 65412—Special automatic machine, for weighing and precision balancing a variety of heavy-duty and diesel engine connecting rods from 7⅜" to 12" center distance. Weighs rods and automatically balance mills to plus or minus 2 grams.

No. 207390—Special, double-end precision boring machine for finish boring, counterboring and chamfering counter shaft, intermediate and shifter shaft holes on power take-off cases. Production 82 pieces per hour at 80% efficiency.



No. 68526—Special double end trunnion machine, fully automatic, for machining special aircraft rivets. Machine is automatically loaded and unloaded. Production rate varies with size of rivet.



No. 73902—Special 4-station automatic index machine for milling joint face, drilling and reaming vertical and horizontal holes in exhaust manifolds. Production 80 pieces per hour at 80% efficiency.

SNYDER VERSATILITY

in engineering and building metal-cutting machines includes not only the great Snyder line transfer machines with automation, but also many smaller and diversified machines in which the standards of performance and economy are no less exacting. A few representative examples are shown.

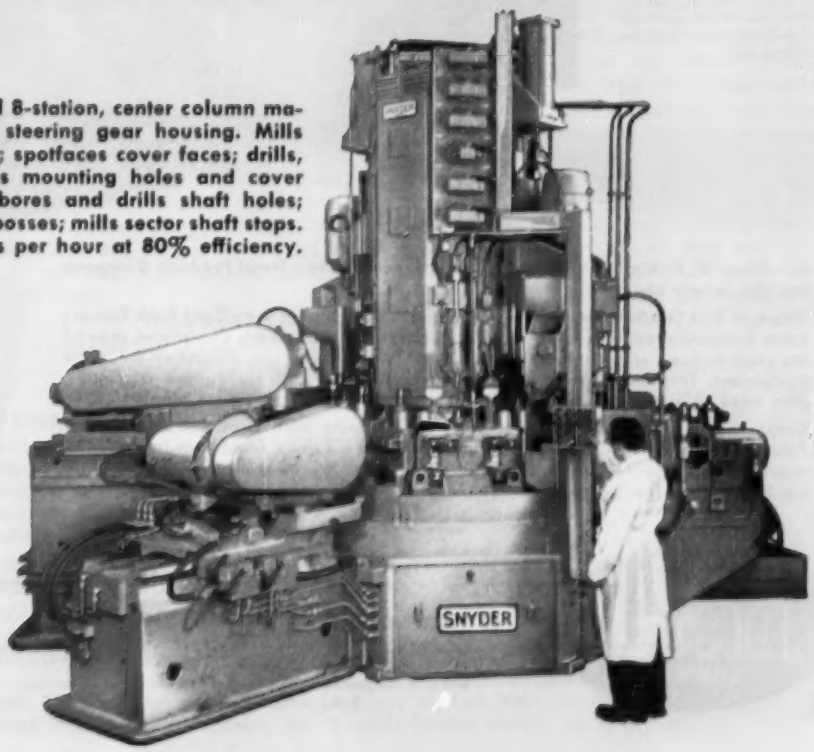
SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

31 Years of Special Machine Tools with Automation

No. 72976½—Special 8-station, center column machine for processing steering gear housing. Mills pads and cover faces; spotfaces cover faces; drills, countersinks and taps mounting holes and cover holes; rough counterbores and drills shaft holes; mills two Welch plug bosses; mills sector shaft stops. Production 260 pieces per hour at 80% efficiency.



BATH PRESSES can TAKE IT... Around the Clock!

The Fort Steuben Metal Products Co., Follansbee, West Virginia specializes in the fabricating of anything in the metal shelving line.

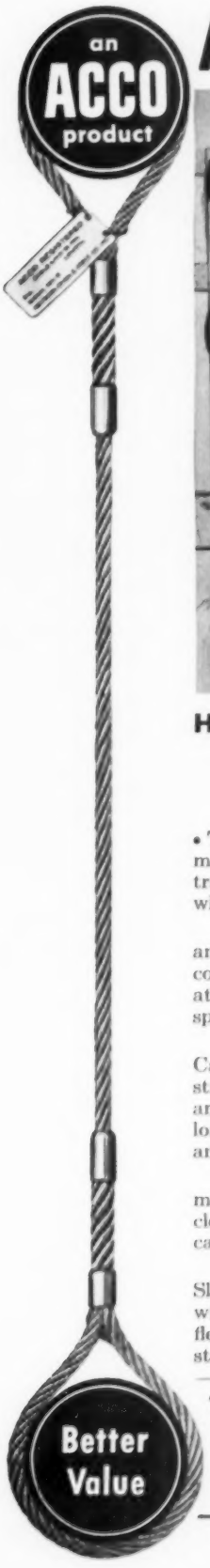
Mr. Albert W. Robinson, Vice President of the Fort Steuben Metal Products Company has this to say about Bath Presses:

"Here at Fort Steuben we are more than satisfied with the way Cyril Bath Presses have demonstrated their ability to take it. Operating as we do, sometimes around the clock to keep up with demand for our shelving, we require dependable, rugged equipment. This ruggedness, coupled with large bed area for dollars expended, plus ease of operation and maintenance makes Cyril Bath Presses ideal."

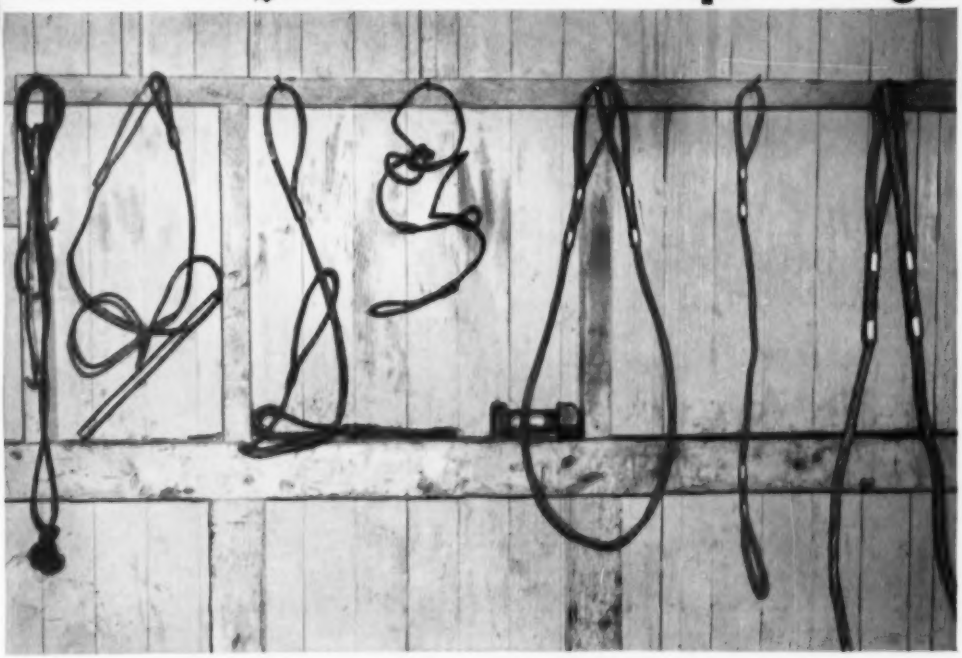
Catalogs are available, without obligation, covering both The Cyril Bath Power Press Brake and P.T. Press line . . . this literature covers important information regarding the features which make BATH Presses your best buy . . . and ask for the Power Press Brake Die Catalog too!

THE CYRIL BATH COMPANY

32340 AURORA ROAD • SOLON, OHIO
(LOCATED IN THE GREATER CLEVELAND AREA)
Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines



ACCO Registered* Wire Rope Slings



HERE'S PROOF OF FREEDOM FROM KINKING . . .

with Cable-Laid Slings

• This sling board in an eastern plant may not make a pretty picture. But it beautifully illustrates savings in handling and production time which can mean big money.

At the far left are a length of hemp rope and metal barrel tongs. Next, three standard construction wire rope slings. The three slings at the right are ACCO *Registered* Slings in our special Cable-Laid construction.

Note the startling difference between the Cable-Laid Slings and those of standard construction. The standard slings are badly kinked and snarled. Hard to handle, they require much longer to rig up—add drastically to production and handling costs.

The Cable-Laid Slings have seen just as much service, possibly more. Yet, they're bright, clean and almost as straight as the day they came from the factory.

CUT RIGGING TIME • For ACCO Cable-Laid Slings combine extreme resistance to kinking with freedom from crankiness. They give the flexibility of manila rope with the strength of steel. As a result they handle easier—save time—cut operating costs.

These qualities are only possible through the combination of a special wire rope construction and the patented DUALOC ending. GALACCO coating keeps Cable-Laid Slings clean and bright and provides maximum corrosion-resistance.

SAFEST SLINGS MADE • ACCO Cable-Laid Slings are registered—incorporate extra safeguards which make them the safest slings made.

Each individual component, made from the highest quality material suited to its use, is tested before assembly—must prove to have strength equal to or greater than the sling body. These components are assembled into slings according to precisely-engineered designs which have proven their safety and reliability in extensive field tests.

Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then, and only then, does it receive the coveted registration certificate and tag.

Get the details on Cable-Laid, or any other ACCO *Registered* Wire Rope Slings, from your distributor—or call the nearest ACCO district branch below. *Trade Mark Registered

FREE FOLDER • Write Wilkes-Barre office for your copy of new folder **DH-532**, which gives strengths and weights (for six different lifts) on a full size range of ACCO *Registered* Cable-Laid Slings.

ACCO

American Chain & Cable Company, Inc., Wire Rope Sling Department

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

WIN a 2-weeks LUXURY

All Expenses Paid,

LAST CHANCE TO *ENTER!* JONES &

NEW HORIZONS

Grand Prize:

Two-Weeks Luxury Vacation Trip for Two, All Expenses Paid, to a choice of one of the following: Paris, Hawaii, The Caribbean, The Canadian Rockies, Plus $400 for spending money, baby sitter fee, etc.

Two 2nd Prizes: Each a Seven-Day All-Expenses-Paid Luxury Vacation for Two to Bermuda. Plus $200 spending money.

Three 3rd Prizes: Each a Shopmaster Combination Saw-Jointer Power Tool, complete with motor.

Ten 4th Prizes: Each a Shopmaster Individual Single-Purpose Power Tool (A Choice of Saw, Drill Press, Jointer, etc.)

Jones & Lamson, famed for opening up NEW HORIZONS in metalworking efficiency, now offers you, personally, NEW HORIZONS — a luxury vacation for two people for two weeks with all expenses paid, to your choice of Paris, Hawaii, The Caribbean or The Canadian Rockies.

Think of it — you can enjoy deluxe travel, finest hotels and accommodations, the very best of everything, plus $400 spending money. Live like a millionaire for two weeks, for just answering this question, "Which Jones & Lamson machine, or machine feature, could, or does, help you most, and Why?"

When you write in (use coupon or not, as you wish), we will send you an official entry form, together with information upon which to base your answer. So don't delay! Even if you've never entered any contest before . . . if you have a good idea and can express it clearly — *YOU* may win this glorious luxury vacation for two! And don't forget — there are other prizes! — two deluxe 7-day all-expenses-paid vacations for two to Bermuda, and 13 prizes of famous Shopmaster home workshop Power Tools! Enter *today!* Read the simple rules, and send in this coupon *NOW!*

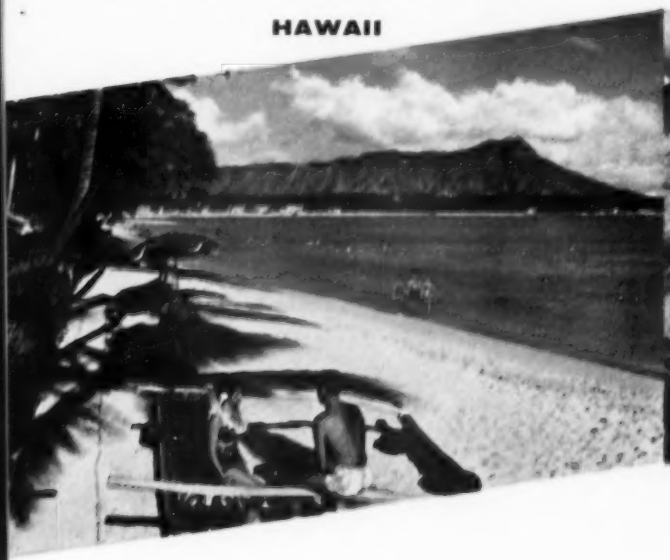
J&L. JONES & LAMSON MACHINE COMPANY

502 CLINTON STREET, SPRINGFIELD, VERMONT

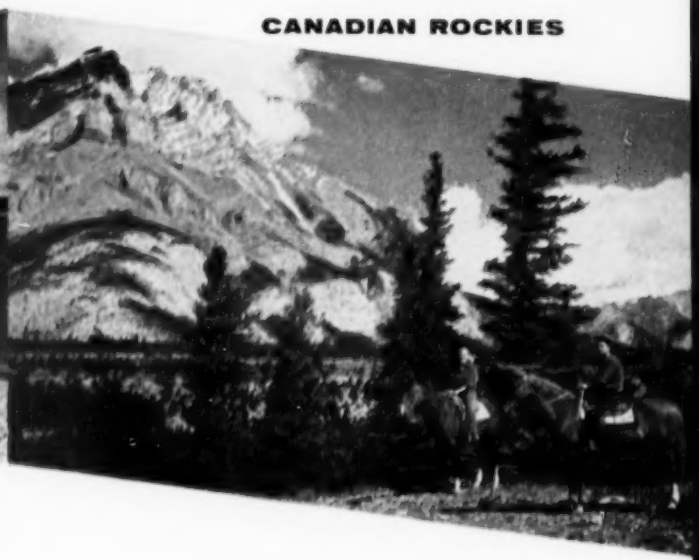
VACATION FOR TWO!

to your choice of . . .

HAWAII



CANADIAN ROCKIES



LAMSON'S CONTEST

CONTEST RULES

Contest is open to all persons, residing in the continental U. S. A., engaged in metalworking or allied industries, except employees of Jones & Lamson Machine Company, its selling agents and its advertising agency, and members of their families.

Contestants merely answer, in 150 words or less, the question "Which Jones & Lamson Machine, or Machine Feature, could, or does, help you most, and Why?"

Entries are to be mailed to Jones & Lamson NEW HORIZONS CONTEST, Box 364, Back Bay Annex, Boston 17, Massachusetts.

Entry must be contestant's own, and must be handprinted or typed on an official Jones & Lamson NEW HORIZONS CONTEST entry form. Entry forms that are not completely filled out will be disqualified. Entry forms filled out in handwriting will also be disqualified. No entries will be returned, and all entries become the property of Jones & Lamson Machine Company.

The submitting of a contest entry implies the contestant's agreement with and submission to all contest rules. Contest entries must be postmarked by midnight July 10, 1956 and received by July 20, 1956.

Board of Judges will include machine tool engineers, production foremen, business executives, trade publication editors, and an engineering college faculty member.

Judges' decisions are final. Entries will be judged for aptness of thought, originality and sincerity. "Literary style", as such, will *not* be a deciding factor. Elaborate or "fancy" entries will receive no extra consideration.

Winners will be announced in Jones & Lamson Machine Company advertisements in trade publications as soon as possible after the judging of the contest.

Easy to Enter! You Could Win!

JONES & LAMSON MACHINE COMPANY
502 Clinton Street, Springfield, Vermont

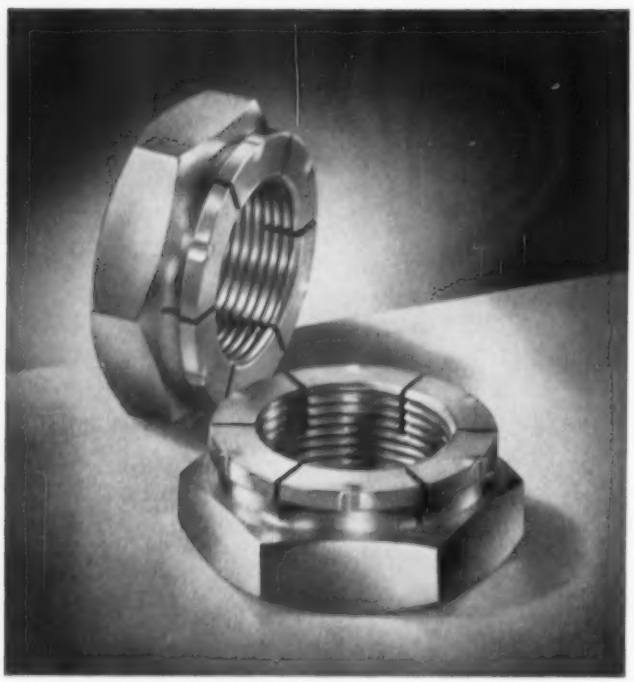
Please send official NEW HORIZONS CONTEST entry form and information to:

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Flexloc thin nuts save space, weight and production time



Self-locking nuts are 30% lower and lighter; speed up assembly with hand or power tools

Self-locking FLEXLOC thin nuts are 30% lower than regular height locknuts of the same nominal diameter. They fit into spaces where regular height locknuts will not go. You can design lighter, more compact units with them.

Where you must reduce weight in a completed assembly, you can save by using shorter bolts with these lighter nuts. And you save production time. The length of engagement of mating threads is shorter: fewer revolutions of hand wrenches or power nut runners are needed to seat them.

FLEXLOC nuts are of 1-piece, all-metal construction. You can use a FLEXLOC fully seated as a locknut or at any point along a bolt as a stop nut. Once the threads in the resilient locking section are fully engaged, the FLEXLOC grips the mating threads with uniform locking torque wherever wrenching stops. Since there are no nonmetallic inserts to come out or deteriorate, the locking life of a FLEXLOC is virtually unlimited.

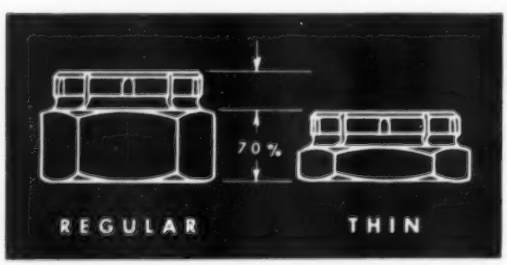
Your authorized industrial distributor stocks FLEXLOC nuts in a variety of sizes, materials and finishes. Consult him for details. Or write us for information about your special locknut problem. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

SPECIFICATIONS
FLEXLOC THIN NUTS

NATIONAL COARSE THREAD—U.S.S

SIZE	A INCHES	H INCHES	WIDTH ACROSS CORNERS	WEIGHT PER 1000 NUTS
6-32	.312	.125	.361	1.8
8-32	.344	.172	.397	2.8
10-24	.375	.172	.433	3.3
¼-20	.438	.203	.505	5.4
5/16-18	.563	.250	.649	11.6
⅜-16	.625	.265	.722	14.9
7/16-14	.750	.312	.866	24.9
½-13	.813	.312	.938	28.4
9/16-12	.875	.359	1.010	36.1
⅝-11	1.000	.391	1.155	54.1
¾-10	1.125	.406	1.299	69.2
⅞-9	1.312	.469	1.516	107.5
1-8	1.500	.563	1.732	171.6
NATIONAL FINE THREAD—S.A.E.				
6-40	.312	.125	.361	1.8
8-36	.344	.172	.397	2.8
10-32	.375	.172	.433	3.3
¼-28	.438	.203	.505	5.4
5/16-24	.500	.250	.577	8.7
⅜-24	.563	.266	.649	11.5
7/16-20	.625	.312	.722	14.9
½-20	.750	.312	.866	21.7
9/16-18	.875	.359	1.010	36.2
⅝-18	.938	.391	1.082	42.4
¾-16	1.063	.406	1.227	54.5
⅞-14	1.250	.469	1.443	84.6
1-14	1.438	.563	1.660	136.3
1⅛-12*	1.625	.625	1.876	193.5
1¼-12*	1.813	.750	2.093	296.0
1⅜-12*	2.000	.812	2.309	389.0
1½-12*	2.187	.875	2.526	498.0

*Steel only (plain or cadmium plated) in stock sizes.



FLEXLOC thin nuts are 30% lower than regular height locknuts. There is a corresponding saving in weight. In sizes through 5/16 in., thin FLEXLOCs meet tensile strength requirements for regular height locknuts. FLEXLOC nuts can be made in the thin type because every thread, even those in the locking section, carries its full share of the load. There are no nonmetallic inserts to waste head space or weaken the structure of the nut.

Standard FLEXLOC self-locking thin nuts are available in plain or cadmium plated alloy steel, for use in temperatures to 550°F; in plain or silver plated corrosion resisting steel, for temperatures to 750°F; and in brass and aluminum, for temperatures to 250°F.

STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION SPS

JENKINTOWN PENNSYLVANIA

Tape that holds in freezing cold!

So cold-resistant, it holds at 40° below . . . so wet-proof, it transmits less moisture than even a wax-impregnated carton. "Scotch" Brand Acetate Fibre Tape is tough, long-aging, dimensionally stable; meets government packaging specification JAN-P-127. 12 colors: red, green, orange, blue, orange-yellow, light green, yellow, light blue, white, black, silver, and gold, plus transparent. Ask your "Scotch" Brand Tape distributor about acetate fibre tapes, or send for folder described.

Always specify "Scotch" Brand, the *quality* tape . . . and stick with it!

ACETATE FIBRE TAPE...*one of more than 300 pressure-sensitive tapes for industry, trademarked...*

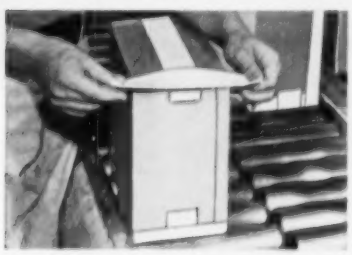
REG. U.S. PAT. OFF.

SCOTCH BRAND

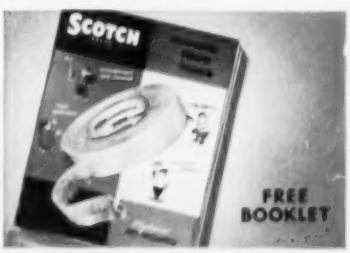
Look what you can do with it!

PACKAGE parts and products quickly, easily, with "Scotch" Brand Acetate Fibre Tape and Automatic Box Sealer S-70. Acetate fibre tape can be printed with sales message, if desired.

CLOSE cartons to be kept under refrigeration. "Scotch" Brand Acetate Fibre Tape No. 710 resists moisture and temperature changes; aggressive adhesive holds even at below freezing.



SEAL cartons against moisture with "Scotch" Acetate Fibre Tape No. 710. Adheres quickly and securely; forms a strong seal that resists abrasion and scuffing.



SEND FOR free folder describing remarkable physical properties of "Scotch" Brand Acetate Fibre Tape and giving valuable use suggestions. Write on your letterhead to "3M" Co., St. Paul 6, Minn., Dept. MA-66.

The term "SCOTCH" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

don't lose a day...
E 4½
75 TON
THE HOTTEST O.B.I.

without the spectacular facts

TOTALLY ENCLOSED . . .
BRAND NEW FROM THE GROUND UP

- Rugged, front-to-back crankshaft with huge crankpin
- Fully concealed, yet accessible, driving mechanism
- Enclosed, rigidly supported gearing operates in sealed oil bath
- Electro-pneumatic friction clutch on crankshaft
- Wider spaced, longer, narrower gibs
- Wider, box type slide all within gibbing
- Precision, hardened, longer-wearing gears
- Compact, straight-line, space-saving, all-steel frame

This is it! The most talked about press in the world! The press that captured the hearts of the entire industry at the Machine Tool Show! The press that was born to do more than any O.B.I. ever built!

Get the spectacular facts and figures on this metalworking marvel . . . the all-new Niagara Series E, Front-to-Back Crankshaft Inclinable. It outmodes everything within its range (75 to 200-ton capacities, 4 ½ to 7 ½ inch shaft diameters, standard and automated models).

PRESS IN HISTORY!

STUDDED WITH SCORES OF
TECHNICAL IMPROVEMENTS

- No overhanging gears, flywheel and other mechanisms
- No damaging crankshaft deflection
- Full support to wide dies — no overhang on slide
- Greater resistance to off-center loading
- Accurate alignment of slide, with minimized tendency to cock
- Substantially increased die life
- Smoother, safer press performance — simpler, thriftier servicing
- Less floorspace required

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Please rush new Bulletin 56 with all the facts on your brand new Series E Inclinable.

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A.M.

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26 FACT-FILLED PAGES

NIAGARA

front-to-back crankshaft INCLINABLE PRESSES

America's Most Complete Line of Presses, Shears, Press Brakes, Other Machines and Tools for Plate and Sheet Metal Work.

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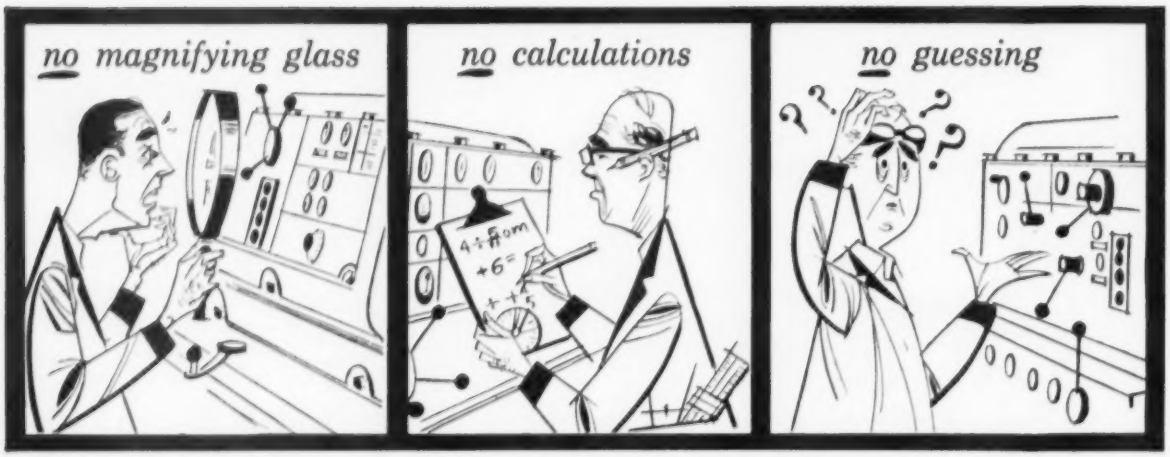
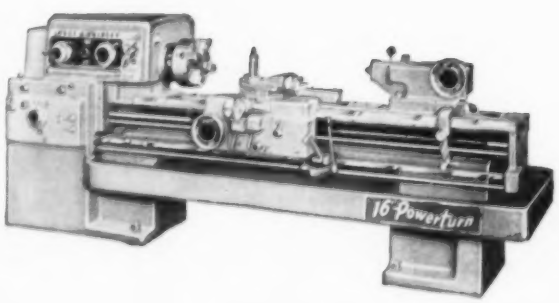


quickly . . . almost automatically with the LODGE & SHIPLEY *Powerturn* LATHE and SPEED-DIAL HEAD!

Take "by-guess" and "by-golly" confusion out of lathe operation! Lodge & Shipley POWERTURN Lathes with *Speed-Dial* Head make speed selection and setting simple as **a...b...c!**

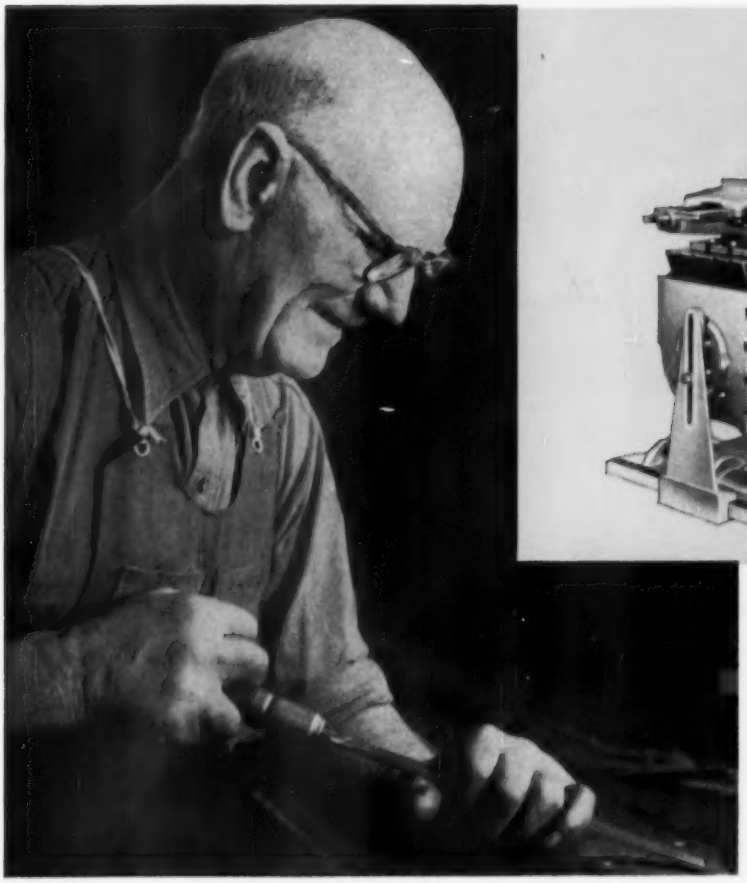
a . . . set work diameter
b . . . read r.p.m. opposite cutting speed
c . . . set levers to automatic indicator lights

This time-saving, fool-proof simplicity is but one feature of New POWERTURN Lathes. Combined with traditional Lodge & Shipley accuracy and rugged strength are many other features for new precision and new operating convenience. New literature . . . ready now . . . tells the complete story: how POWERTURN Lathes are designed to facilitate turning to higher levels of profitable operation, 13, 16 and 20-inch sizes; Engine, Toolmaker and Gap types plus famous COPYMATIC with both 45° and 90° tool slides. **The Lodge & Shipley Company, 3055 Colerain Ave., Cincinnati 25, Ohio.**



Lodge & Shipley

your LODGE-*ical choice!*



VMA Universal Shaper Model ES-26

UTOMORDENTLIG YRKESSKICKLIGHET

(SUPERB CRAFTSMANSHIP)

VMA SHAPERS - built by Sweden's master craftsmen - are engineered to maintain precise tolerances in continuous heavy-duty production. Built to U. S. standards, VMA Shapers—both heavy duty and standard models — meet all requirements for modern versatile machines.

VMA Model ES Heavy Duty Shapers, available in Plain and Universal Models and with 18", 22", 26", and 28" stroke, feature:

- Wide selection of ram speeds and power feeds
- Automatic forced lubrication system
- Horizontal power rapid traverse of table through independent motor
- Double helical crank gear
- Chrome nickel steel transmission
- Anti-friction bearings throughout
- Dependable safety clutch

VMA Model EV Series . . . economical standard-duty Shapers with stroke lengths from 14" to 24".

- Highly accurate and dependable, Model EV Shapers are ideal for job shop or tool room use not requiring the extra power of the ES Series. Easy to operate — economical to own.

austin

INDUSTRIAL CORPORATION

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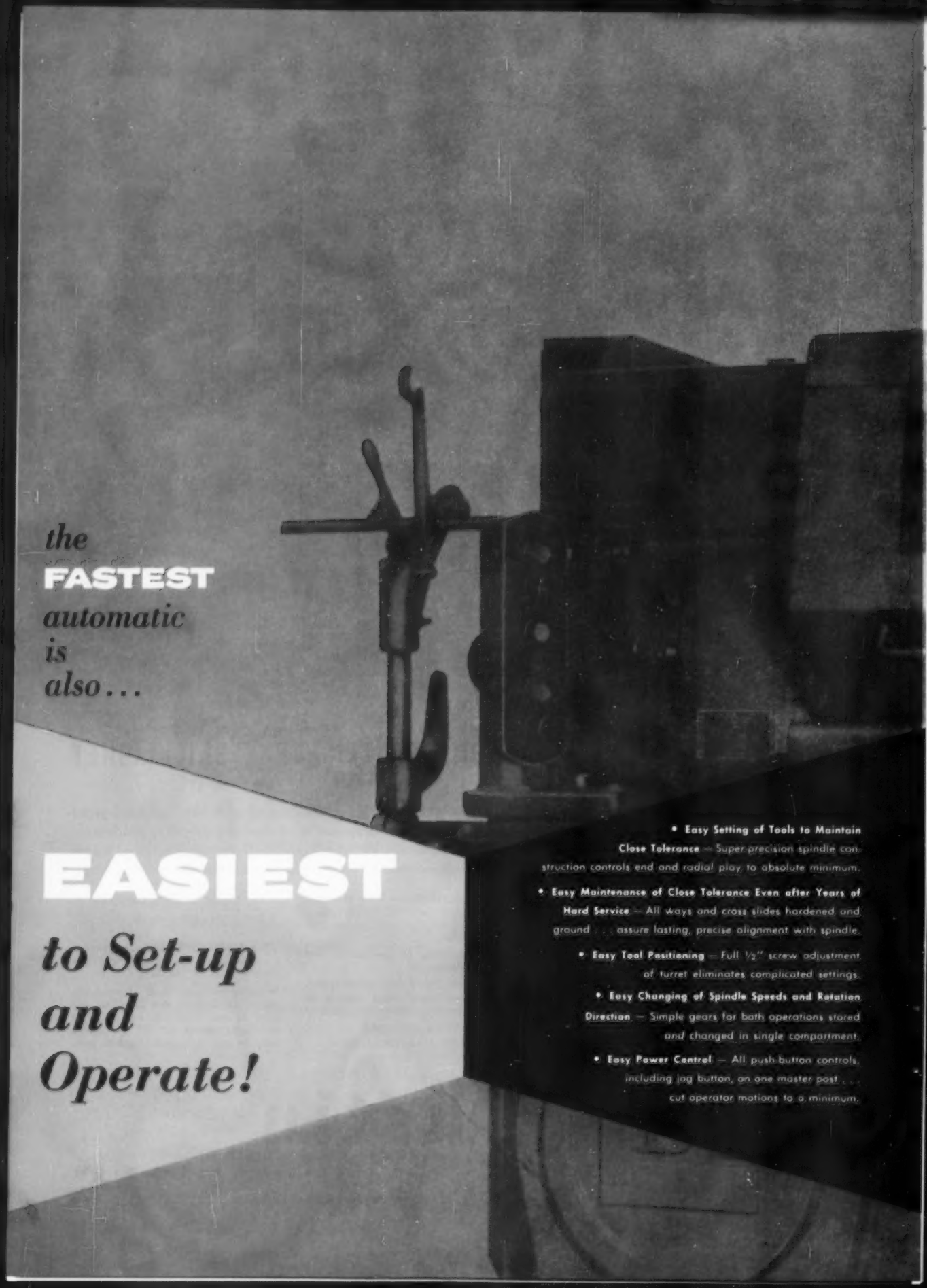


the **FASTEST** *automatic is also . . .*

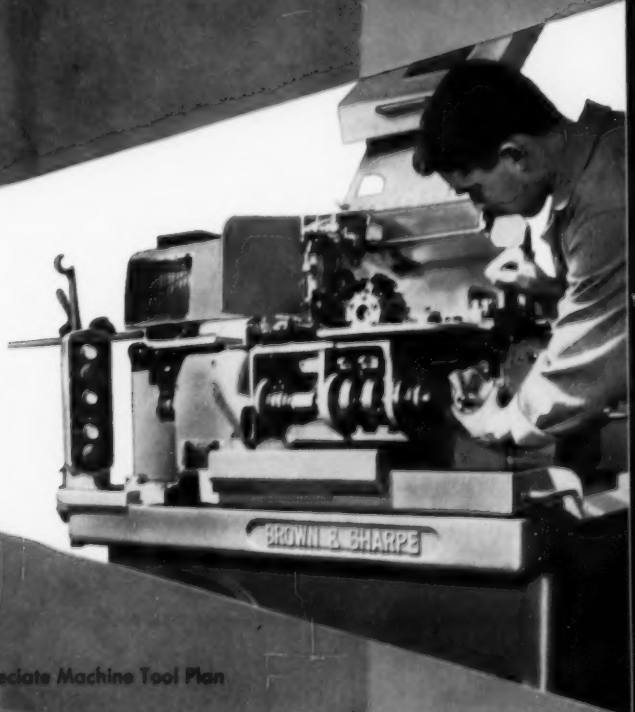
EASIEST

to Set-up and Operate!

- **Easy Setting of Tools to Maintain Close Tolerance** — Super-precision spindle construction controls end and radial play to absolute minimum.
- **Easy Maintenance of Close Tolerance Even after Years of Hard Service** — All ways and cross slides hardened and ground . . . assure lasting, precise alignment with spindle.
- **Easy Tool Positioning** — Full ½" screw adjustment of turret eliminates complicated settings.
- **Easy Changing of Spindle Speeds and Rotation Direction** — Simple gears for both operations stored *and* changed in single compartment.
- **Easy Power Control** — All push-button controls, including jog button, on one master post . . . cut operator motions to a minimum.

Brown & Sharpe
No. 00 Automatic
Screw Machine

That's right! The fastest automatic on the market also holds the record for ease of set-up and operation! In fact, the Brown & Sharpe No. 00 Automatic Screw Machine provides a unique combination of high speed, easy operation, and low maintenance that steps up overall efficiency as much as 33⅓%! Push-button controlled, modern in every detail, it's the truly advanced automatic for turning, forming, one-chip finishing to 0.0005". Only a few of its time-saving features are listed on these pages. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.



Ask about Our Pay-as-You-Depreciate Machine Tool Plan

Brown & Sharpe MBS

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut

Wherever die sets are used

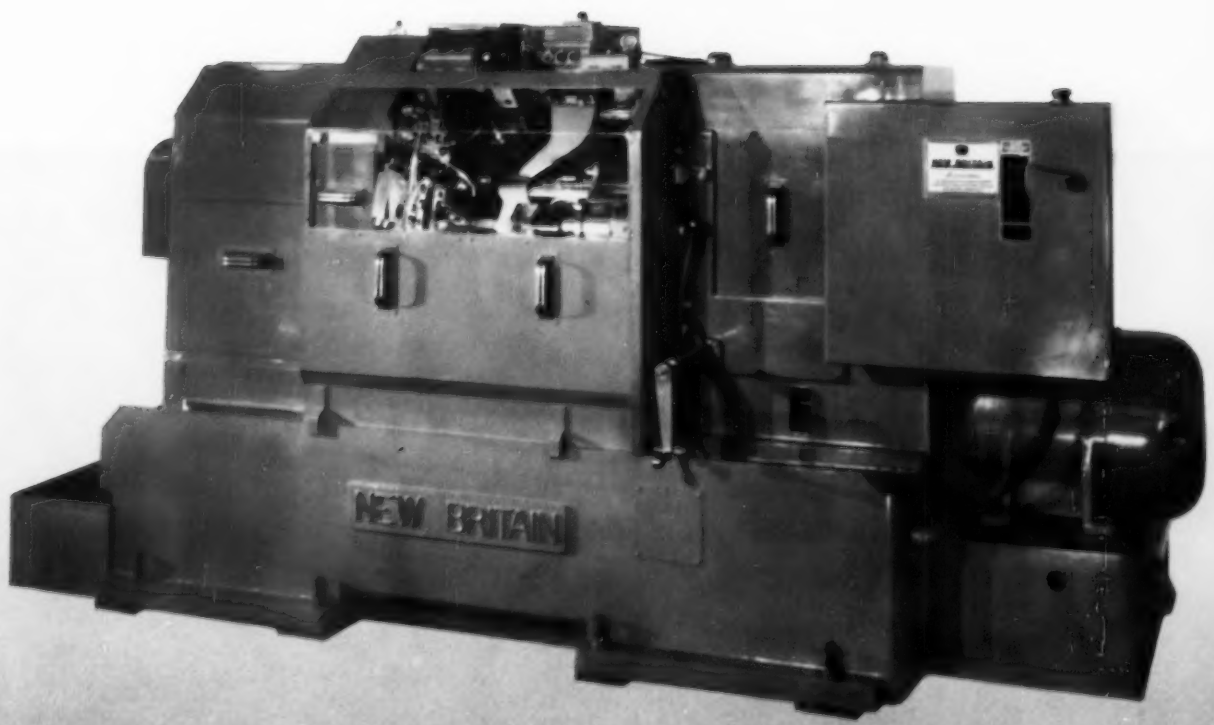
PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

a long new step forward
in bar machine productivity

THE NEW BRITAIN MACHINE CO.
Model 62
Automatic Bar
Machine
NB

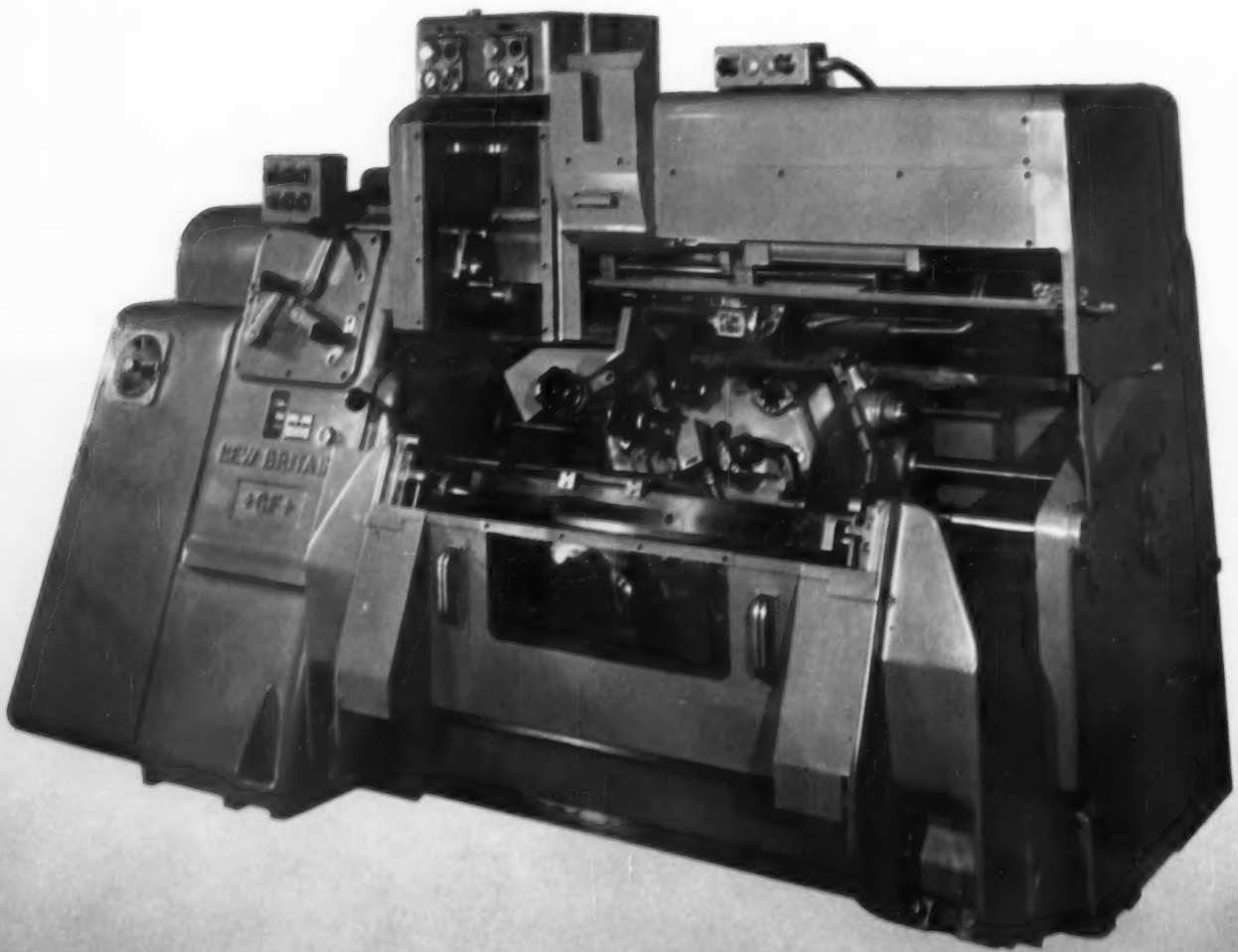
Here is a new New Britain bar machine with the ruggedness, power, speed and versatility to shed new light on your profit picture. Where you have bar work that now requires more than one machine, it may be practical to eliminate costly finishing operations by doing the whole job on a New Britain Model 62. Ask your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

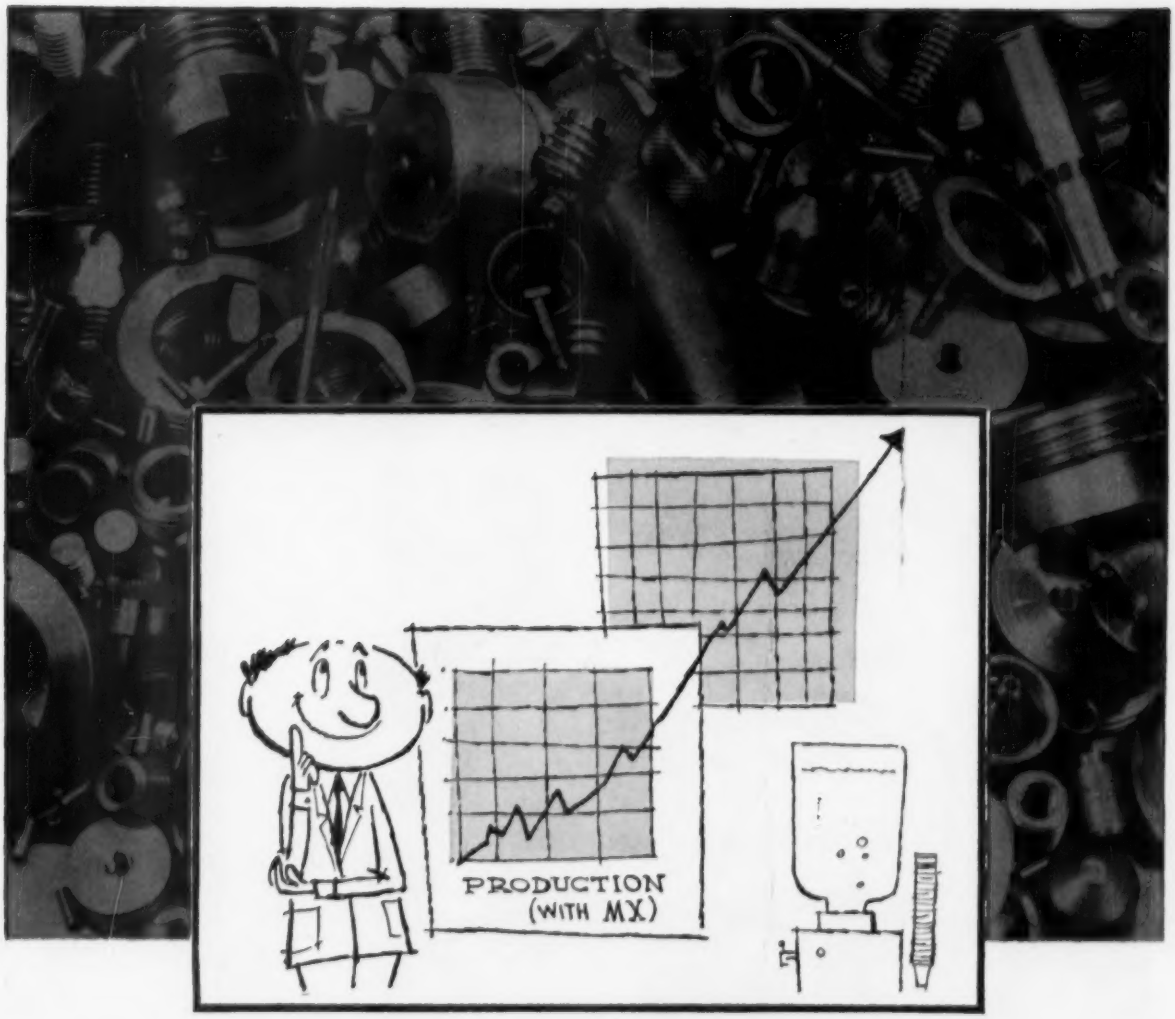


old methods can't compete

If you do *any* turning you should investigate the New Britain +GF+ line of copy turning lathes—whether your work calls for sustained production or short runs demanding quick setups. It turns tapers and complicated contours with the same setup used for simple O.D.'s. No need for expensive form tools. Let us demonstrate this completely different approach to turning in a color motion picture demonstration at your desk.

THE NEW BRITAIN MACHINE CO.
Model 11/70
New Britain +GF+
Copying Lathe
NB





PLEASANT THINGS HAPPEN when you put USS Free-Machining MX Steel to work. You'll find that you can use cutting speeds as much as 50% greater than the speeds at which regular Bessemer grades are normally run. Your production will increase from 10 to 50%. Tools will last up to twice as long. Part finish will be better. And you'll have fewer rejects.

What's more, USS MX has so consistently outperformed ordinary screw stock that we can promise you with complete confidence that *MX will cut the cost of any part* you now machine from regular Bessemer grades. It's been proved in hundreds of shops.

And here's another reason why MX is your best buy today. USS Free-Machining MX has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today . . . yet it costs no more than ordinary screw stock.

Switch to MX. Produced in all the popular screw stock sizes, this production-boosting, cost-reducing steel is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trademark. In hot-rolled form, MX is available direct through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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UNITED STATES STEEL SUPPLY DIVISION
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Bigger output . . . longer tool life . . . lower costs

USS

—when you do the job with free-machining **MX**

UNITED STATES STEEL

Russell C. Westover, Jr., President of Ray Oil Burner Company, tells the secret of

"How to make hay without sunshine!"

"Make hay at midnight or in a rainstorm? Sure—why not?

"Modern farmers have found a way. They cure it a few minutes after cutting—in big dehydrating plants!

"But there's one catch. Profits could disappear in a hurry if the fires go out. That's why they use Ray Oil Burners.

"And that's why Ray uses Air Express!

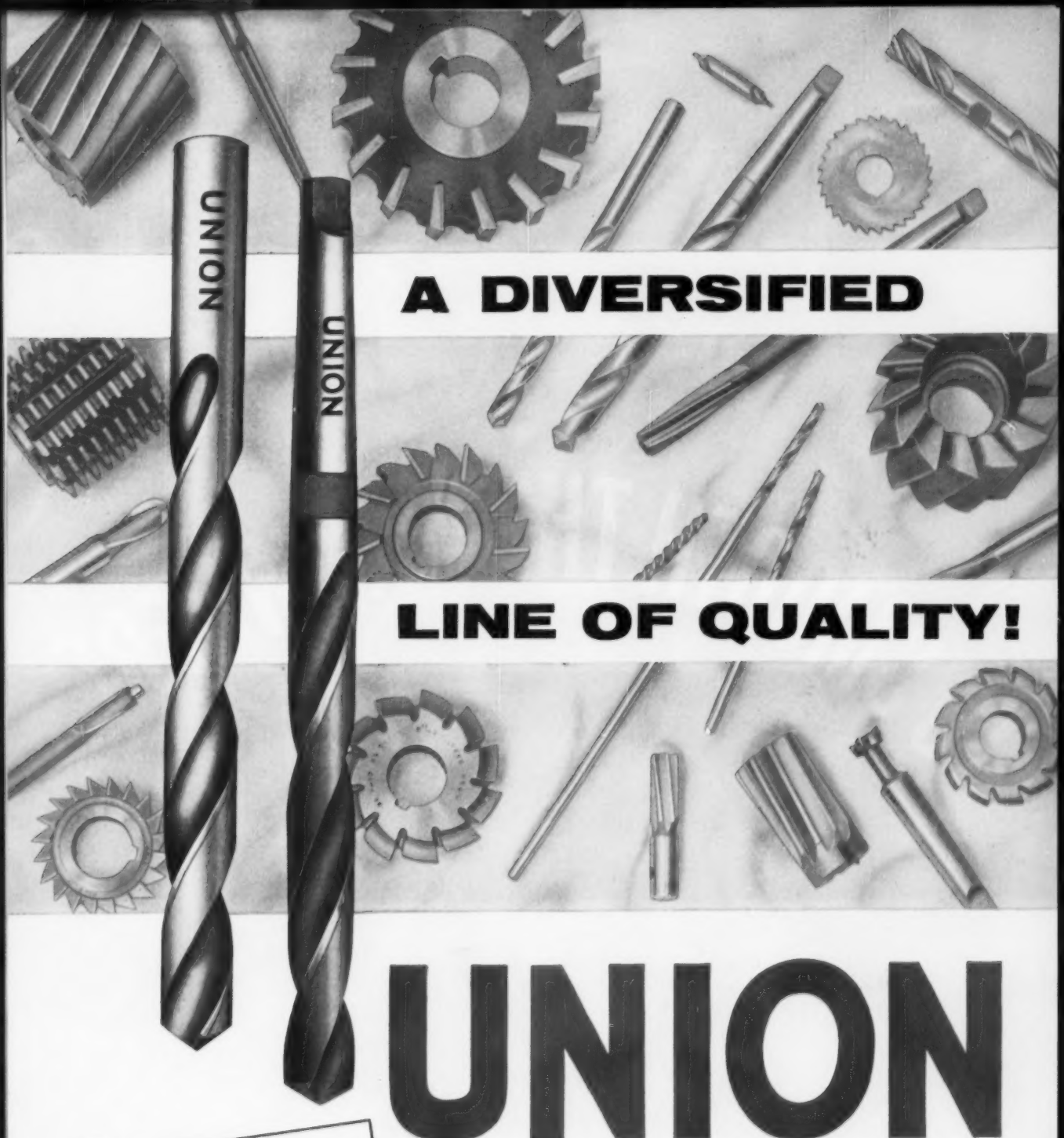
"In addition to his own stock, any Ray dealer in the country can draw on our 'super stockroom' of 40,000 different parts. It's only a few hours away by Air Express!

"It has helped build our reputation for fast service. And it saves money! 10 lbs. from San Francisco to Portland, Ore., costs $3.78 by Air Express. That's $1.37 less than the next lowest-priced complete, door-to-door air service."

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY



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In every drilling operation there's a particular drill that will do the job for you quickly, accurately and economically. Union offers a complete selection of top quality drills, standard and special, to suit the requirements of your job.

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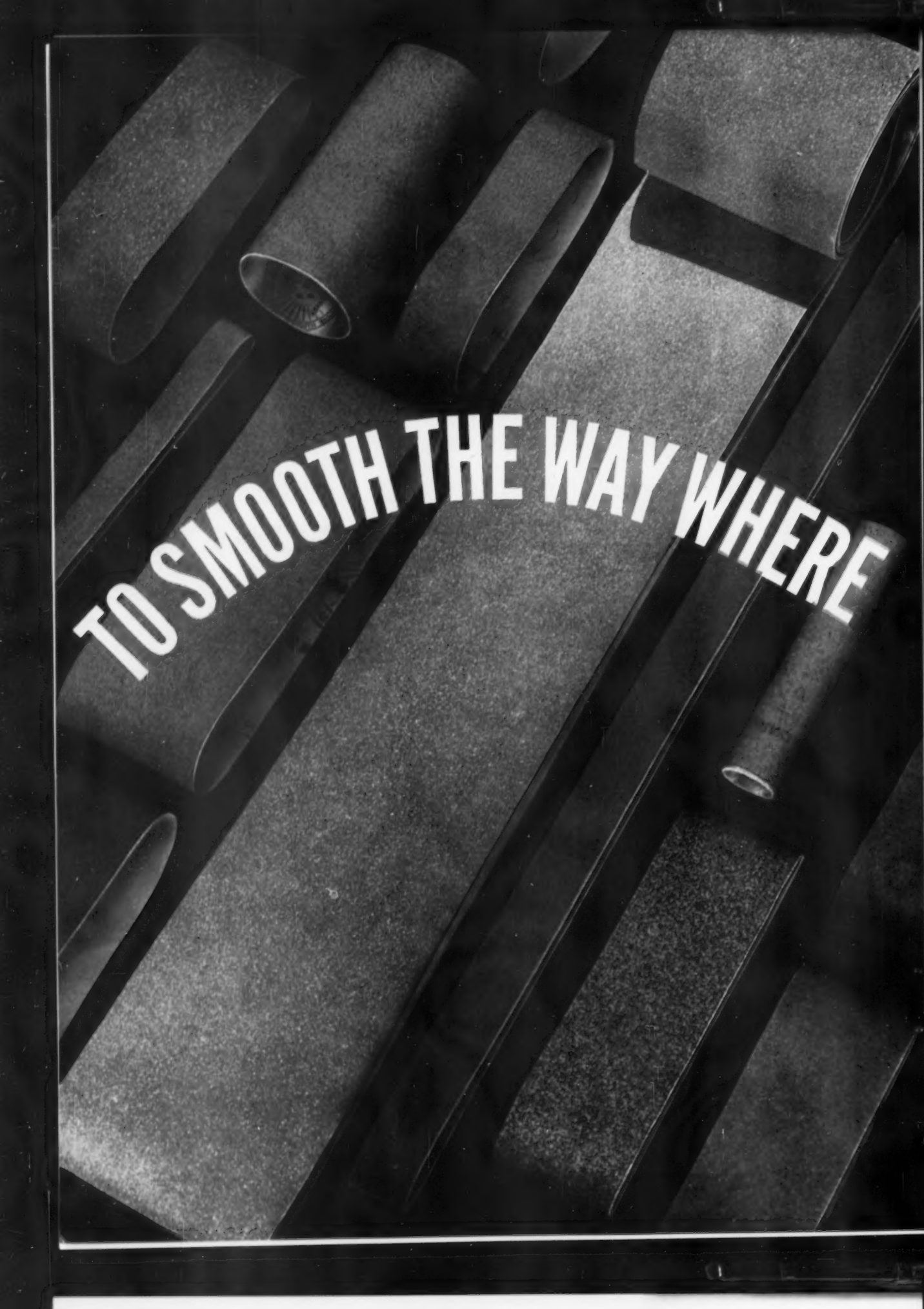
TO SMOOTH THE WAY WHERE

THE BELT WITH A VELVET JOINT

All JEWEL BRAND Abrasive Belts are finished by the velvet joint process — a development of the AP Laboratory and a major contribution to the advance of the abrasive industry. Velvet joint belts lie smooth . . . do not jump or bump under the work.

A COMPLETE LINE OF ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products in various combinations of grain, bond, backing and flexibility.

A SPECIAL TYPE OF QUALITY CONTROL

More than modern methods and rigid standards control each step in the manufacture of JEWEL BRAND Coated Abrasives . . . there's an inherent pride of workmanship developed by long-service employees in a country-located plant that helps to assure superior quality.

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SALESMEN WITH AN EYE ON SERVICE

AP salesmen capitalize on the flexibility of their plant facilities to provide an extra measure of service with every order, and they make a special effort to anticipate as well as know their customers' requirements.

JEWEL BRAND

COATED ABRASIVES

JEWELOX • JEWELITE • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT

We say this without reservation—will back it up with proof:

New Balanced Mobil D.T.E. Oils Can Improve Your Production And Reduce Manufacturing Costs

For years Mobil D.T.E. oils have set the standard of quality for all hydraulic and circulating oils. Recently they were dramatically improved—so much so that their margin of superiority is now greatly increased.

New Mobil D.T.E. oils are *balanced* to meet the widest range of operating conditions. They will give years of trouble-free service—even in continuous high temperature circulating systems. They will keep your machines free from deposits over the complete range of service. They will give you the highest degree of protection against wear...rust...corrosion. In fact, tests show *most machines will become obsolete before these oils need changing* when operating at normal temperatures.

Let us show you concrete *proof* that new balanced Mobil D.T.E. oils can improve production and cut manufacturing costs. Ask your Mobil representative for the "balanced" story.

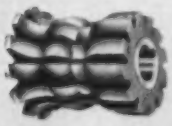
SOCONY MOBIL

FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

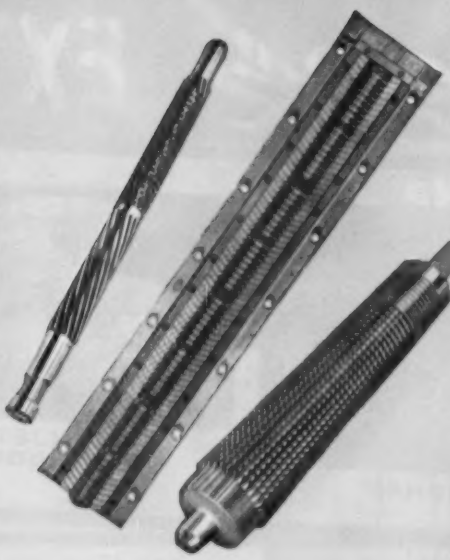
GROUND MULTIPLE THREAD MILLING CUTTERS

FORM RELIEVED MILLING CUTTERS



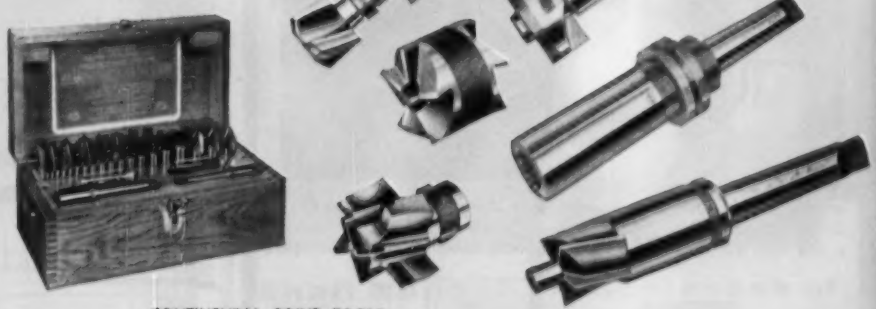
SINGLE POINT TOOLS

FORM TOOLS



BROACHES

FACE MILLS



CONTINENTAL DRIVE TOOLS

Why These Cutting Tools are *Production Proved*

Continental is an Ex-Cell-O subsidiary.

As such, we are constantly trying out new tool designs, new methods, in Ex-Cell-O's big parts production shops.

There could be no finer "proving ground" for testing new materials and new methods. There are no finer cutting tools than "Production-Proved" tools by Continental.

Call in your Ex-Cell-O representative or contact Continental in Detroit for information about them.

CTW

Continental TOOL WORKS

Division of Ex-Cell-O Corporation, Detroit 32, Mich.

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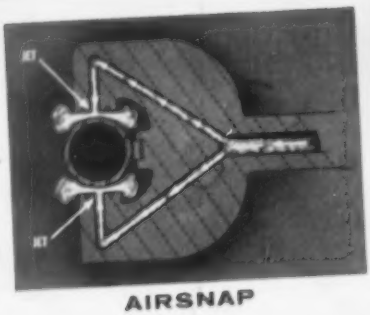
Check EXTERNAL*

BASIC TOOLING ELEMENTS

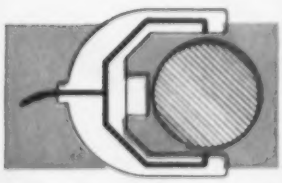


AIRSNAP

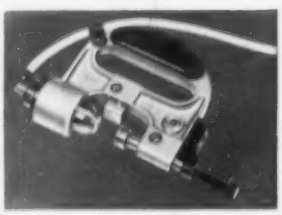
PLUNJET CARTRIDGES

AIR RING

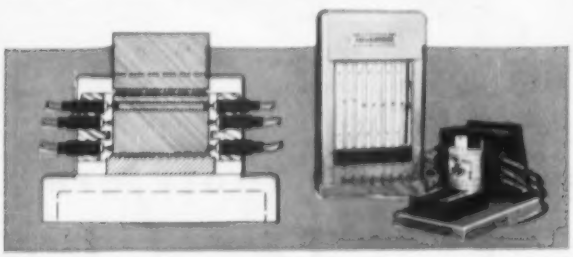
Outside Diameter



● Airsnap having two opposed standard jets, where tolerance is .002" or less and surface finish is less than 65 rms.



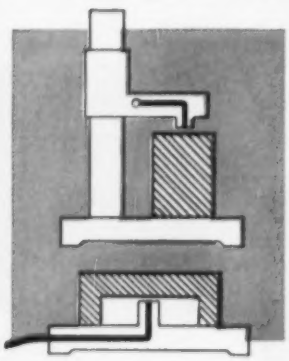
● Adjustable Airsnap with Plunjet Cartridge opposed to the adjustable anvil.



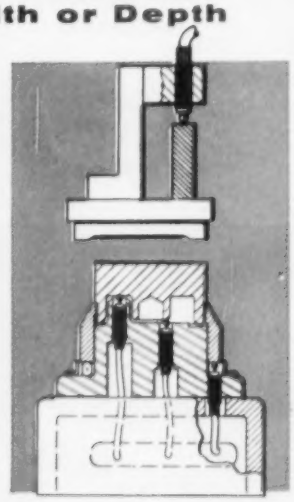
● Fixture in which are mounted two or more Plunjet Cartridges.

● Air Rings and Air Pots for true diameter, average diameter and out-of-round.

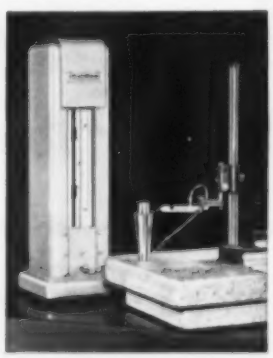
Height, Width or Depth



● Gage incorporating one standard jet where tolerance is .005" or less and surface finish is less than 65 rms.

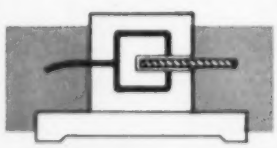


● Gage incorporating one or more Plunjet Cartridges.



● Airetest Indicator.

Thickness



● Gage incorporating two opposed standard jets—especially for thin parts, gage blocks, etc., having close tolerances.

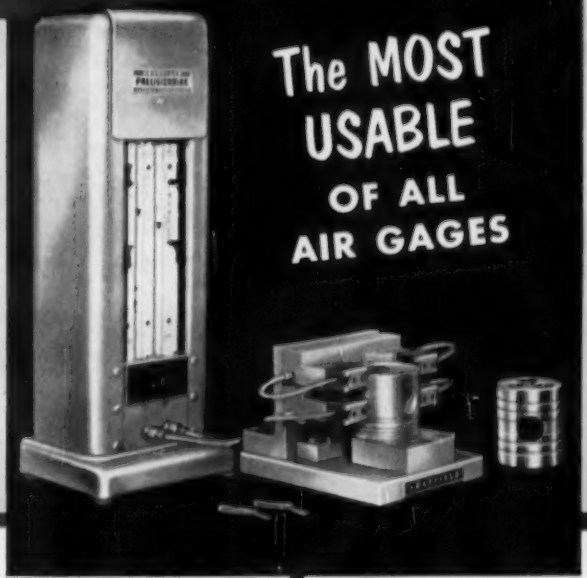
Contour

● Multiple Plunjet Cartridges mounted in a suitable fixture.

MORE PRECISIONAIRES BOUGHT THAN ALL OTHER MAKES

DIMENSIONS and SURFACES

with SHEFFIELD'S PRECISIONAIRE



The MOST USABLE OF ALL AIR GAGES

CHARACTERISTICS

High precision with instant response

•

Has widest amplification range—100 to 100,000:1

•

Accommodates widest tolerance range—.000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read—no need to squat and squint

•

Human error minimized

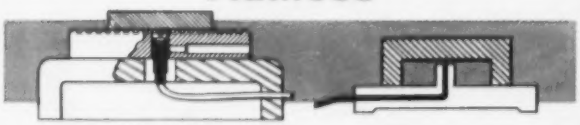
•

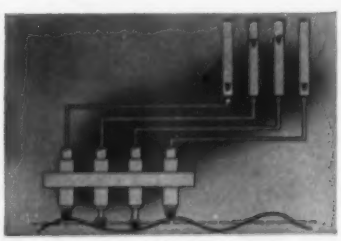
Checks one dimension or many simultaneously

•

Elements have long service life

Flatness

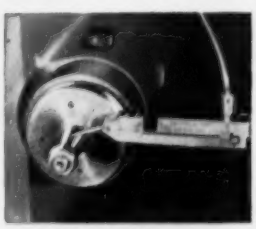




● A standard Air Jet or Plunjet Cartridge inserted in a precision surface plate, granite or steel.

● Multiple Plunjet Cartridges mounted in a suitable gage.

Shaft Runout

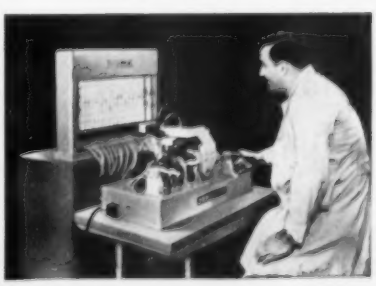


● Airetest Indicator.

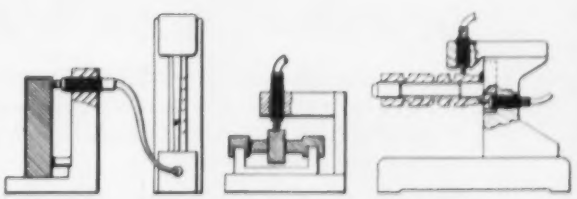
Squareness of Surfaces or Concentricity

● Fixture incorporating one standard jet for close tolerance parts having good surface finish.

Simultaneous Multiple Checking



● As many dimensions as 36 or more are being checked simultaneously to high accuracy on Sheffield Multiple Dimension Precisionaire Gages.



● One or more Plunjet Cartridges mounted in a suitable gage.

* For checking internal dimensions, relationship and countless other conditions, write Instrument Dept. 1, THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.

7221

OF AIR GAGES COMBINED

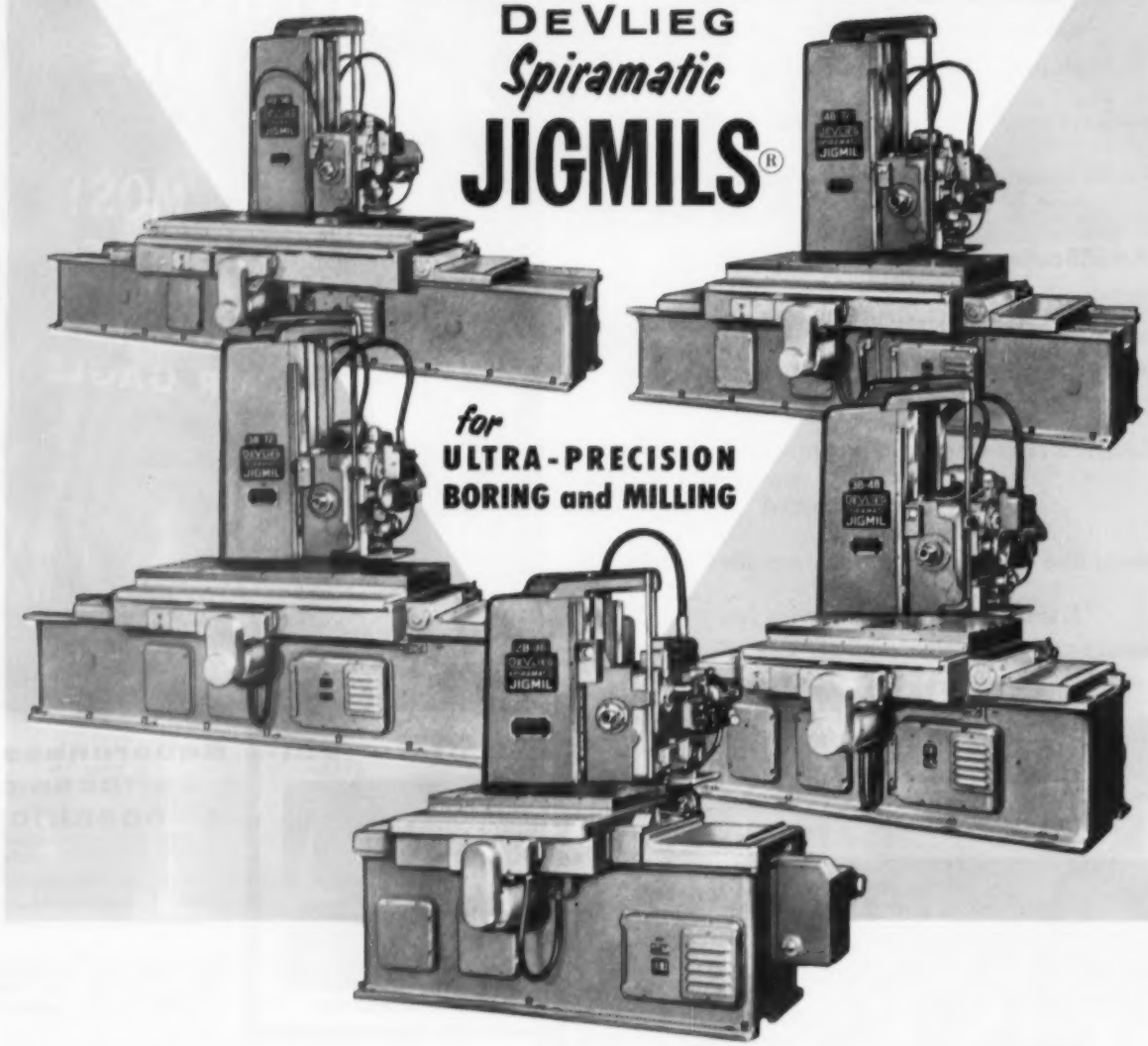
GOLDEN ANNIVERSARY

SHEFFIELD

Precision and measurement for modern

Every day... *Everywhere*... Your Competitors are using

DEVLIEG
Spiramatic
JIGMILS®
for
ULTRA-PRECISION BORING and MILLING



THE "ACCEPTED" MACHINE FOR JIGLESS PRODUCTION OR ONE-PIECE JOBS

The DeVlieg System of "JIGLESS BORING"— ★ Eliminates expensive jigs ★ Permits complete flexibility of product design ★ Insures interchangeable assembly of parts without hand fitting.

DeVlieg JIGMILS are widely used in toolrooms and experimental shops for machining all types of jigs, fixtures and experimental parts to precise limits of accuracy with a minimum of operator skill.

Come to Detroit
SEE A PRACTICAL
DEMONSTRATION OF THE
JIGMIL TECHNIQUE

DEVLIEG MACHINE COMPANY
Write for Illustrated Catalog

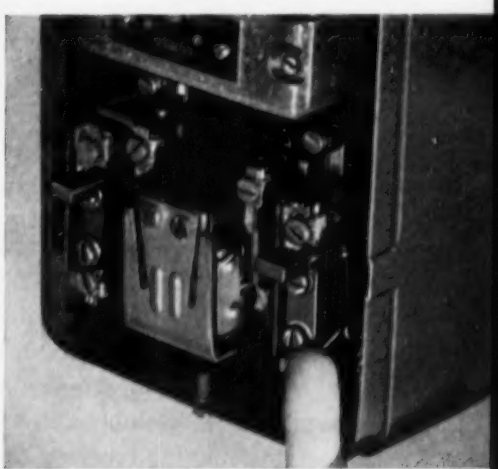
450 Fair Avenue • Ferndale
DETROIT 20, MICHIGAN

These maintenance features show . . .

3 Ways G-E Starters Are Easy For You To Use

(1) **CONTACTS** are changed without disturbing wiring. Captive springs on movable contacts prevent loss, assure proper tip pressure.

(2) **COIL** change is easy. Just remove 4 screws, lift out the coil and movable magnet. No need to remove the starter from the enclosure.



(3) **OVERLOAD RELAYS** are set for manual or automatic reset simply by moving a spring on the relay from one slot to the other.

General Electric magnetic starters are designed to simplify maintenance. All changes are simple, and require little time and trouble. Contacts are accessible from the front for inspection or removal, and the strongbox coil is easily changed.

Bi-metallic overload relays provide either manual or automatic reset. Used with a selector switch, the automatic setting on the relay makes restarting fully automatic; used with a push button, it permits the start button to restart the motor without pressing the reset button.

Your G-E Distributor will be glad to give you more information, or write for Bulletin GEA-6198, Section 733-11, General Electric Company, Bloomington, Illinois.

GENERAL ELECTRIC

Maytag switches to STANICOOL HD *Soluble Oil... makes two-way saving*

1 *Cost of soluble oil reduced*

2 *Soluble oil consumption cut two-thirds*

A 300 ton Verson press at the Maytag plant, Newton, Iowa, is used for piercing holes in the inner tubs of Maytag's fine automatic washers. Material used is 18 gauge enameling iron. Holes are pierced in six automatic cycles. A total of 936—$\frac{3}{16}$ inch holes and 6—$\frac{19}{32}$ inch holes are incised in each tub.

A check of manufacturing costs on the tubs disclosed that the cost of soluble oil per unit produced was too high. Standard Oil lubrication specialist J. I. Nelson, working with plant management, suggested a switch to STANICOOL HD Soluble Oil. The switch was made and Maytag received the first part of its two-way saving: the cost of soluble oil per gallon was reduced. Then it was found that the same high quality product could be turned out, without loss of tool life, while spraying only every third tub. Formerly *each* tub was sprayed with soluble oil before punching. With STANICOOL HD, Soluble Oil consumption was reduced two-thirds. And thus, Maytag received part two of its two-way saving.

Perhaps STANICOOL HD Soluble Oil can help you make similar savings. Find out more about this quality soluble oil. Call your nearby Standard Oil office. There is one near you in any of the Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Maytag, leader in cutting laundry time for modern homemakers, knows how to cut manufacturing costs, uses STANICOOL HD.

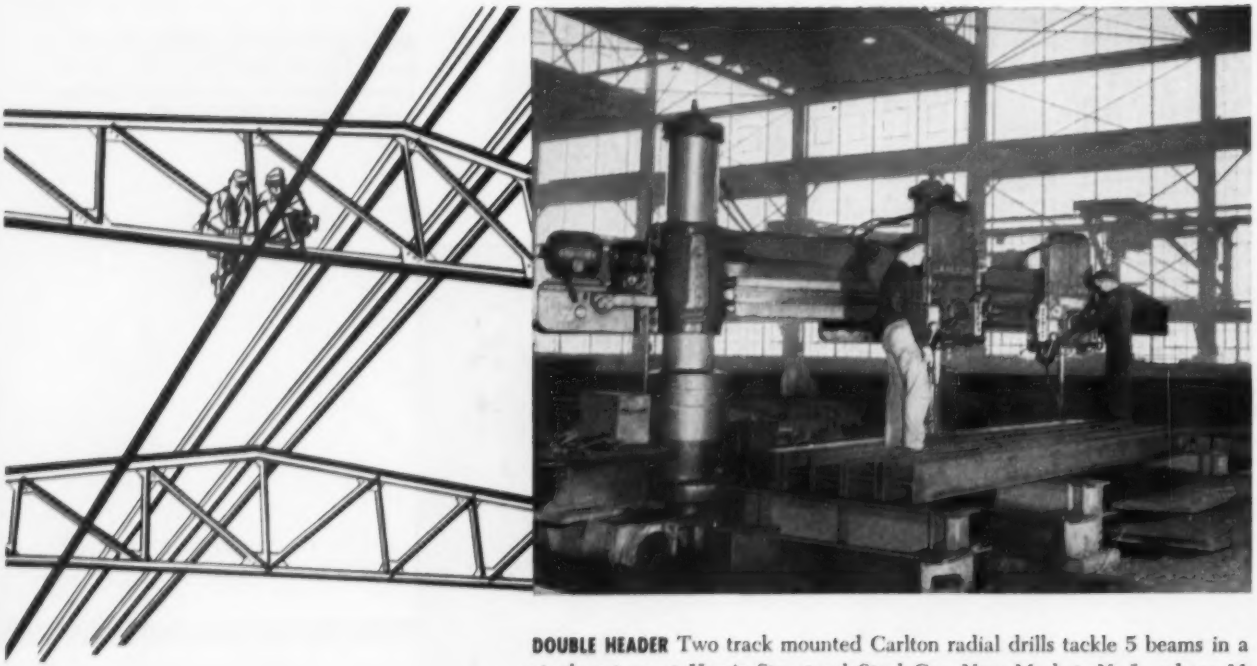
Dwight Norton (right), a Maytag plant foreman, inspects automatic washer inner tub with Jesse I. Nelson, Standard Oil lubrication specialist. Jesse Nelson is well qualified to provide lubrication technical service. He has a B. S. degree in engineering from the University of Iowa and has completed the Standard Oil Sales Engineering School. Jesse has been helping customers with lubrication problems for more than three years. Customers find his experience and training pay off *for them.*

Quick facts about STANICOOL HD Soluble Oil

- Emulsifies readily with all waters.
- Forms stable, uniform emulsion.
- Does not turn rancid.
- Non-injurious to men, machines and work.
- Economical. Meets work requirements with relatively low emulsion concentrations.
- Prevents rusting of work and machines.
- Gives better tool life.
- Doesn't form gum on machines.

STANDARD

STANDARD OIL COMPANY
(Indiana)



DOUBLE HEADER Two track mounted Carlton radial drills tackle 5 beams in a single set-up at Harris Structural Steel Co., New Market, N. J., where 11 other Carlton radial drills are also used for this important hole production.

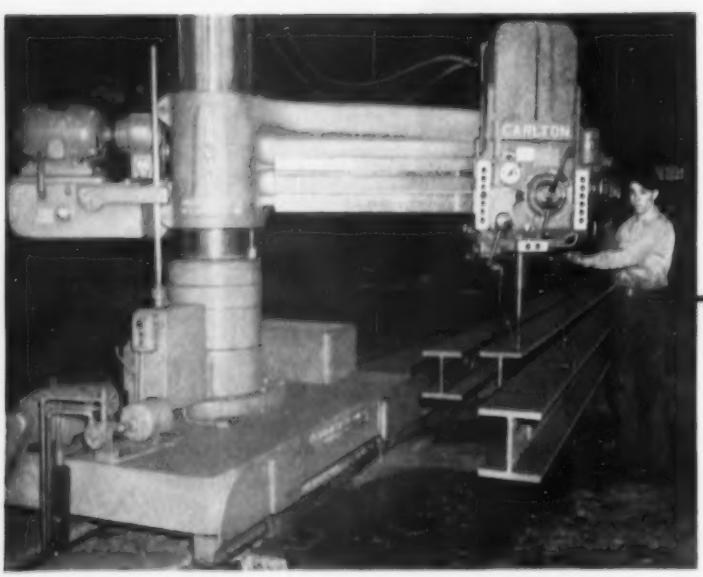
CARLTON'S ON THE

IN THE STRUCTURAL STEEL

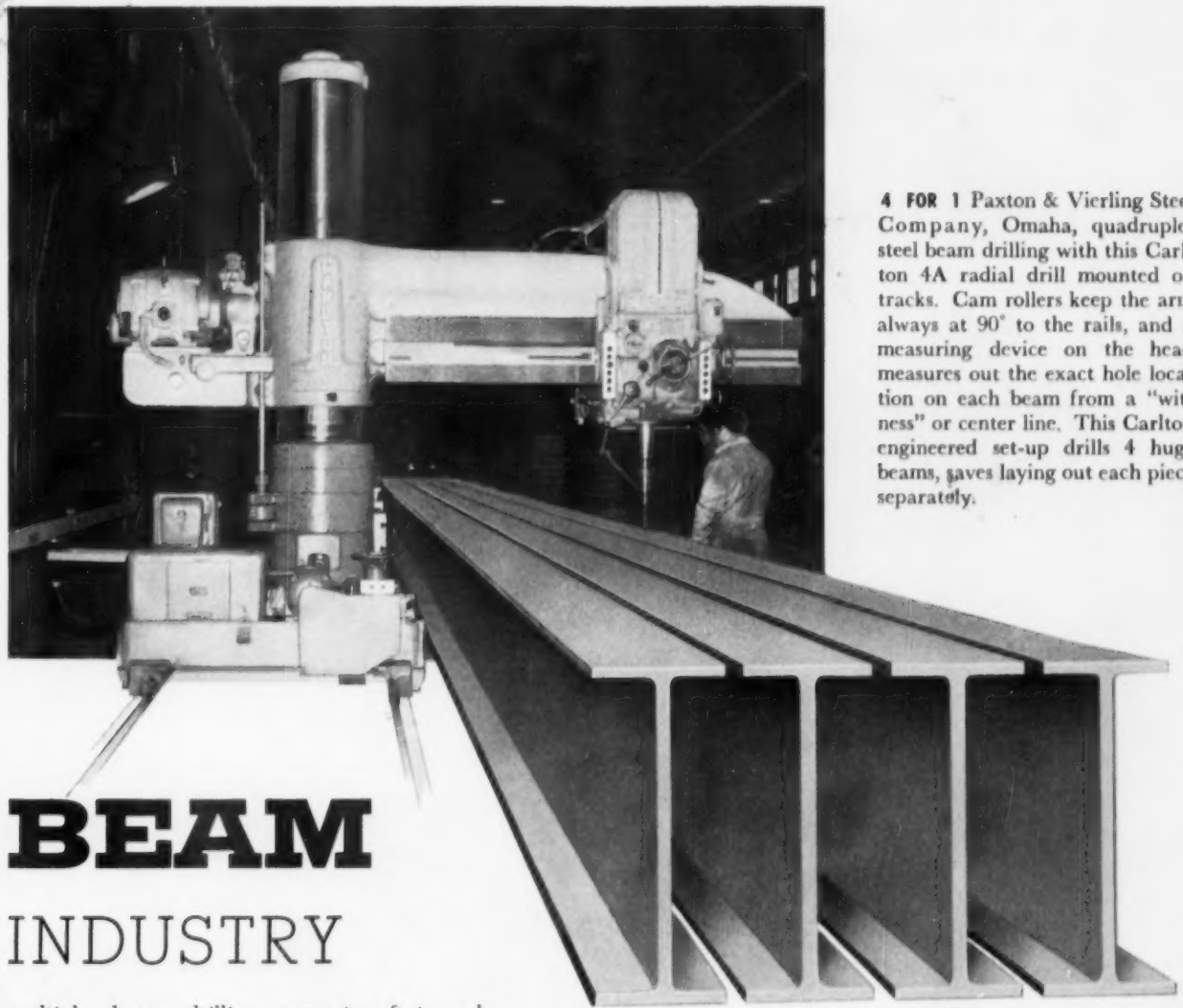
drills several beams at one setting

Mobility, king size and engineering skill have made Carlton the leading radial drill in the structural steel industry. Special track mounting takes Carlton's drilling facilities up and down the entire length of even the longest beam. And Carlton's long arm reaches out over several beams.

In addition, Carlton has engineered several ingenious and inexpensive devices which make



MOHAMMED GOES TO THE MOUNTAIN It's smarter, easier and cheaper to bring the drill to the beams. And the Carlton radial drill on wheels is just the machine tool for the job. Drills through this heavy steel beam like so much cheese . . . and there's plenty of room for three or more beams under the long Carlton arm. Photo courtesy Ingalls Iron Works Co., Birmingham.



4 FOR 1 Paxton & Vierling Steel Company, Omaha, quadruples steel beam drilling with this Carlton 4A radial drill mounted on tracks. Cam rollers keep the arm always at 90° to the rails, and a measuring device on the head measures out the exact hole location on each beam from a "witness" or center line. This Carlton engineered set-up drills 4 huge beams, saves laying out each piece separately.

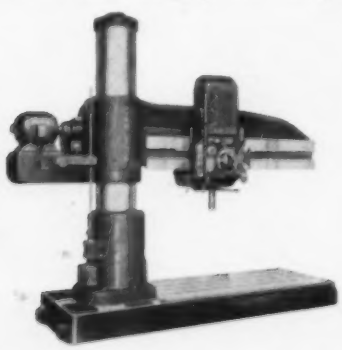
BEAM INDUSTRY

multiple beam drilling accurate, fast and practical.

Carlton brings every industry the advantage of

- a broad range of sizes: arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26".
- a choice of three speed-feed control systems: programming, preselector and manual.
- an exclusive combination of standard features at no extra cost: 3-unit power clamping, low-hung drive, positive tooth feed clutch, and easy, economical operation and maintenance.

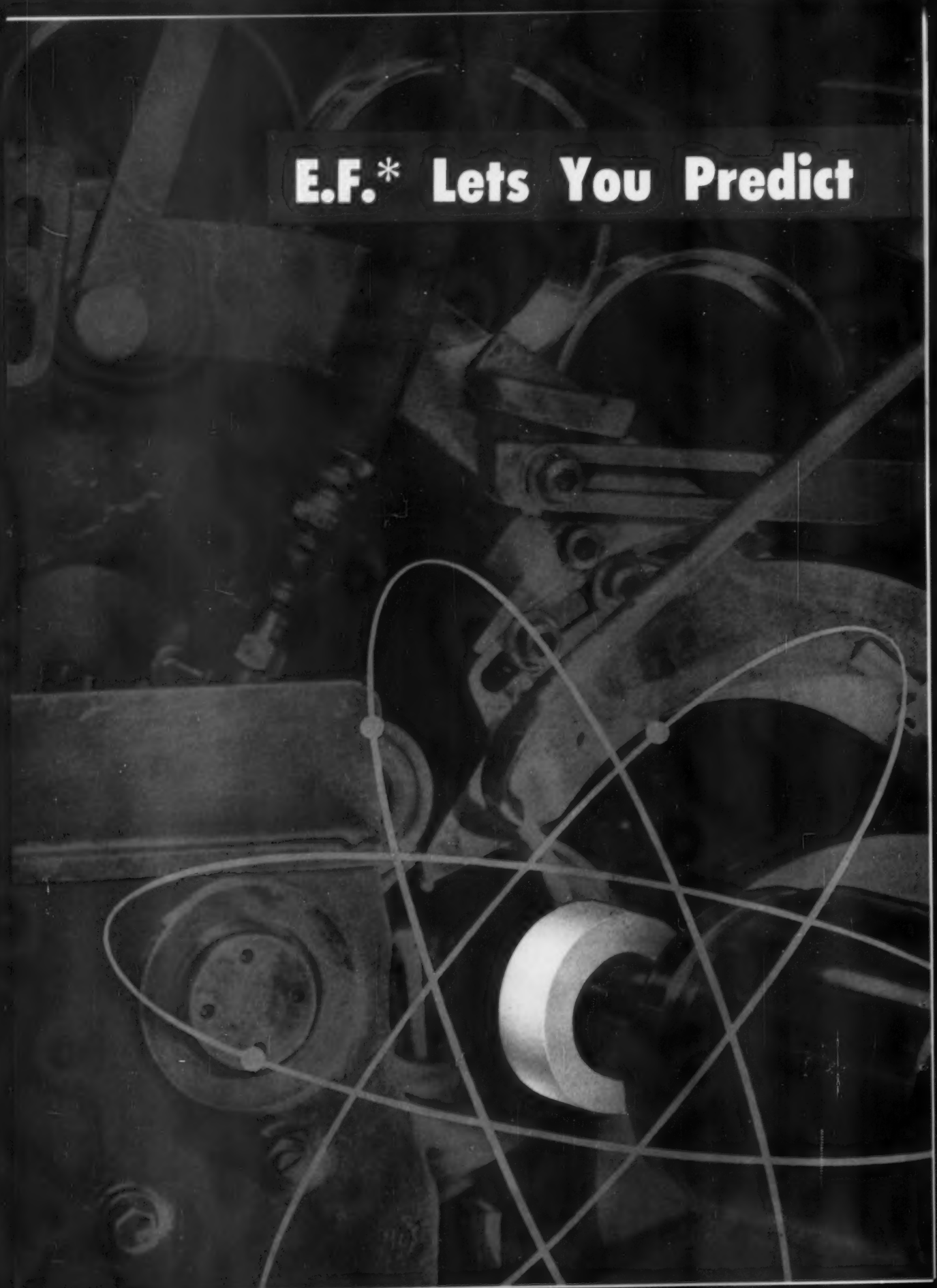
There's a Carlton radial drill, and a Carlton-engineered tooling set-up for every drilling requirement. For information on the best Carlton for you, write for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton

radial and horizontal drills

Get "the hole story" . . . send today for descriptive bulletins


E.F.* Lets You Predict

Grinding Wheel Performance

***ELECTRONIC FORMULATION is a basic manufacturing improvement which makes grinding wheel accuracy equal to the precision of automated production.**

When the output of machines like this centerless internal grinder feeds a production line . . . grinding wheels *must* maintain their prescribed production rates!
BAY STATE'S "EF" lets you predict such dependable grinding action because it offers:

GREATER ACCURACY in selecting the right wheel for the finish and production rate you need.
"EF" is based upon a new, straight-line progression of wheel hardnesses and structures. Specifications can be pin-pointed on this basic line within much closer tolerances.

GREATER DEPENDABILITY of cutting life, giving a more reliable basis for predicting production per wheel.

"EF' uses the unerring accuracy of an electronic "brain" to calculate *precise* amounts of each ingredient. These determine the grade and structure, hence the *performance* of the finished wheel.

GREATER UNIFORMITY in cutting qualities of replacement wheels, for continuous production at most efficient rates.

"EF" retains essential formula figures in the perfect "memory" of electronically punched cards. This assures identical duplication of materials in reproducing the wheels prescribed for your needs.

GREATER CONSISTENCY in grade and structure, for steady flow of parts at "within tolerance" finish and dimensions.

"EF" has established the most accurate standards by which grinding wheels can be specified, produced, and reproduced. It is your most logical source of complete confidence in production grinding wheels.

Get ALL the E. F. benefits
See your BAY STATE Distributor!

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO.,
Westboro, Mass., U.S.A.

Branch Offices and Warehouses — Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co.(Canada) Ltd., Brantford, Ont.

Something more

than craftsmanship

produces that built-in accuracy of a Hendey Tool and Gage-Makers' Lathe

The best is not good enough for Hendey craftsmen who produce machines like our 9 in. Tool and Gage-Makers' Lathe — machines that give you toolroom tolerances easily, with no "tricks" or time-consuming adjustments.

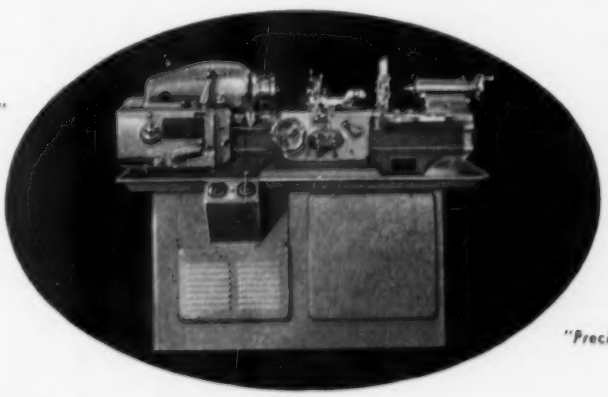
One of our men is grinding a spindle in the picture on the opposite page. It's the *care* he uses in determining wheel speed, feed, speed of work rotation, coolant flow, and wheel selection that makes the difference between a good spindle and a superior one. Experience tells him the proper relationship of these factors to the type of steel used in the spindle and the degree of hardness to which it has been processed.

Constant operating accuracy and maximum rigidity are assured because the spindle is mounted by other "craftsmen who care" in super-precision, antifriction bearings at both ends.

An electronically controlled drive is available for this 9 in. Tool and Gage-Makers' Lathe to give you quiet, infinitely variable spindle speeds from 15 to 3000 rpm. On facing cuts, stepped diameters, and tapers, you can change speeds during the cut by selecting the desired rpm on the control rheostat. Belt drive gives you smooth, vibration-free power to the spindle for fine finishes in the 25 to 3000 rpm range. Speed range from 15 to 250 rpm is achieved by back gears which operate at very low velocity.

When you're looking for the best in quality and quantity of toolroom output, look at this precision-built Hendey Tool and Gage-Makers' Lathe. Call your Hendey dealer for complete information about this machine.

Hendey 9" x 24" Tool and Gage-Makers' Lathe

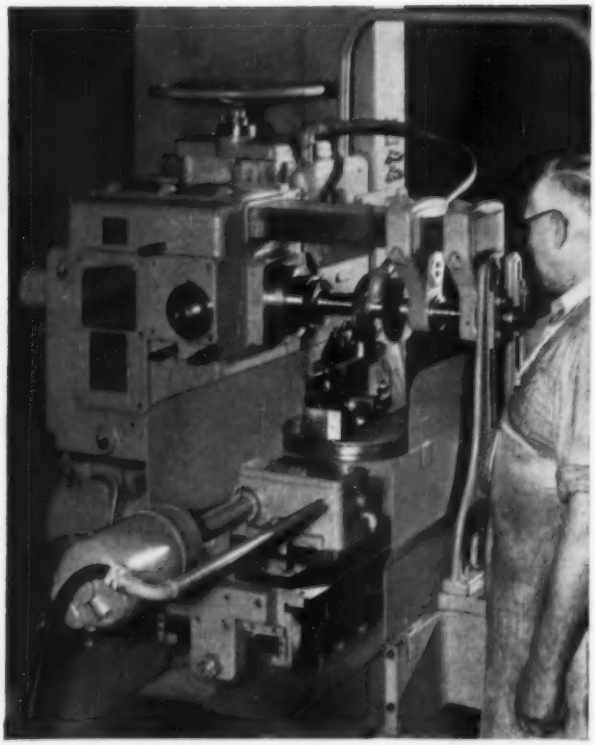


"Precision with Production"

Hendey machine division
BARBER-COLMAN COMPANY
61 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

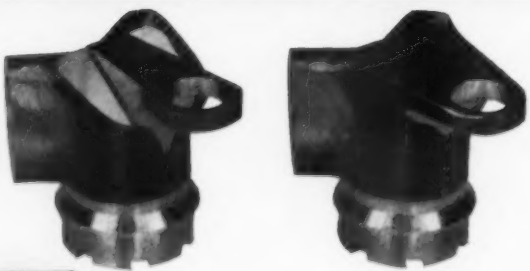
For Better Milling Methods and Lower Costs..



Use SUNDSTRAND Machines and "Engineered Production" Service

Basically, there are two approaches to solving milling problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary. This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling.

The following three examples of Sundstrand "Engineered Production" Service show how (1) a standard Rigidmil (2) a semi-standard Rigidmil and (3) a special Rigidmil are used to solve three different production milling problems. Even though your problem may not be shown, the experience Sundstrand engineers have gained in solving these and many other problems enables them to offer the most practical solution for your specific job. Just ask for a Sundstrand "Engineered Production" analysis of your milling job.



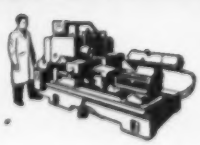
1

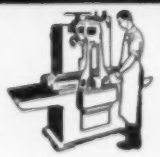
Standard Rigidmil Mills Fuel Nozzles

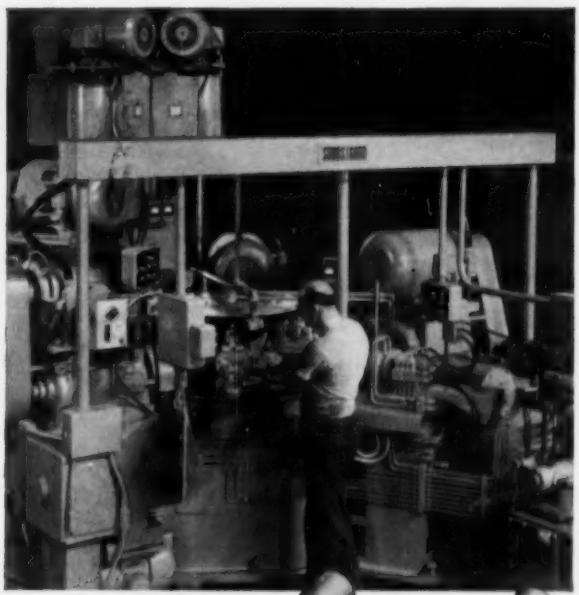
This standard Model 22 Rigidmil has been provided with a standard automatic index base for milling the bosses on body fuel nozzles. Its two fixtures permit the operator to unload and re-load parts during the milling cycle on another part to make loading time free.

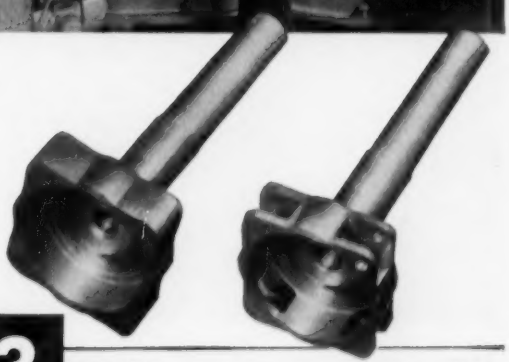
SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







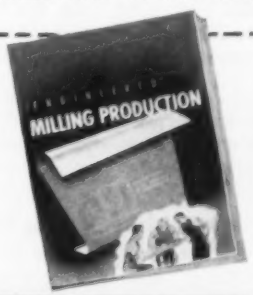


2 Milling Clutch Drums On Semi-Standard Rigidmil

This standard Sundstrand Model 22 Rigidmil is provided with two spindle heads and two automatic index bases for milling six slots in a transmission neutral clutch drum.

3 Milling Output Shafts On Special Rigidmil

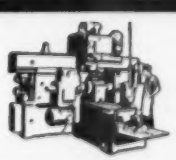
This special Sundstrand 6 station indexing machine has a 48″ diameter automatic indexing table. It mills 3 pockets in each flange of an automotive transmission output shaft.

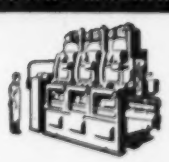


FREE DATA

You'll find plenty of milling methods in this book . . . methods that may provide a short cut or profitable solution to similar jobs in your shop now. Tooling diagrams and machine designs are both included. Write for your copy today. Ask for Bulletin No. 168.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

"Finish first in your league"

...with J&L COLD FINISHED LEADED STEELS

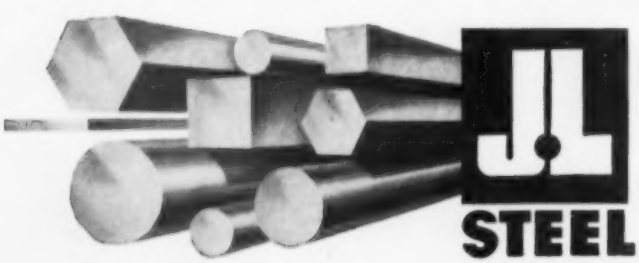
These modern, superior J&L Leaded free-machining cold finished steels are meeting with outstanding acceptance in machine shops everywhere. They are a star member of the complete line of premium quality, free-cutting cold finished bar steels produced over the years by J&L specialists. Thus, we can recommend the right type to help solve your particular machining problems.

Available in *both Bessemer and Open Hearth grades*, J&L Leaded steels offer:

- **SUPERB MACHINABILITY**—because they enable you to use optimum cutting speeds, to secure longer tool life and to produce superior surface finishes.
- **GREATER UNIFORMITY**—because they are completely J&L-produced from the basic raw materials to guarantee optimum uniformity which is so necessary for modern industry's high-speed machining operations.
- **HIGHEST QUALITY**—because they must meet the rigid quality standards developed by J&L through years of leadership in the development and production of free-cutting steels.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor for prompt and efficient service.

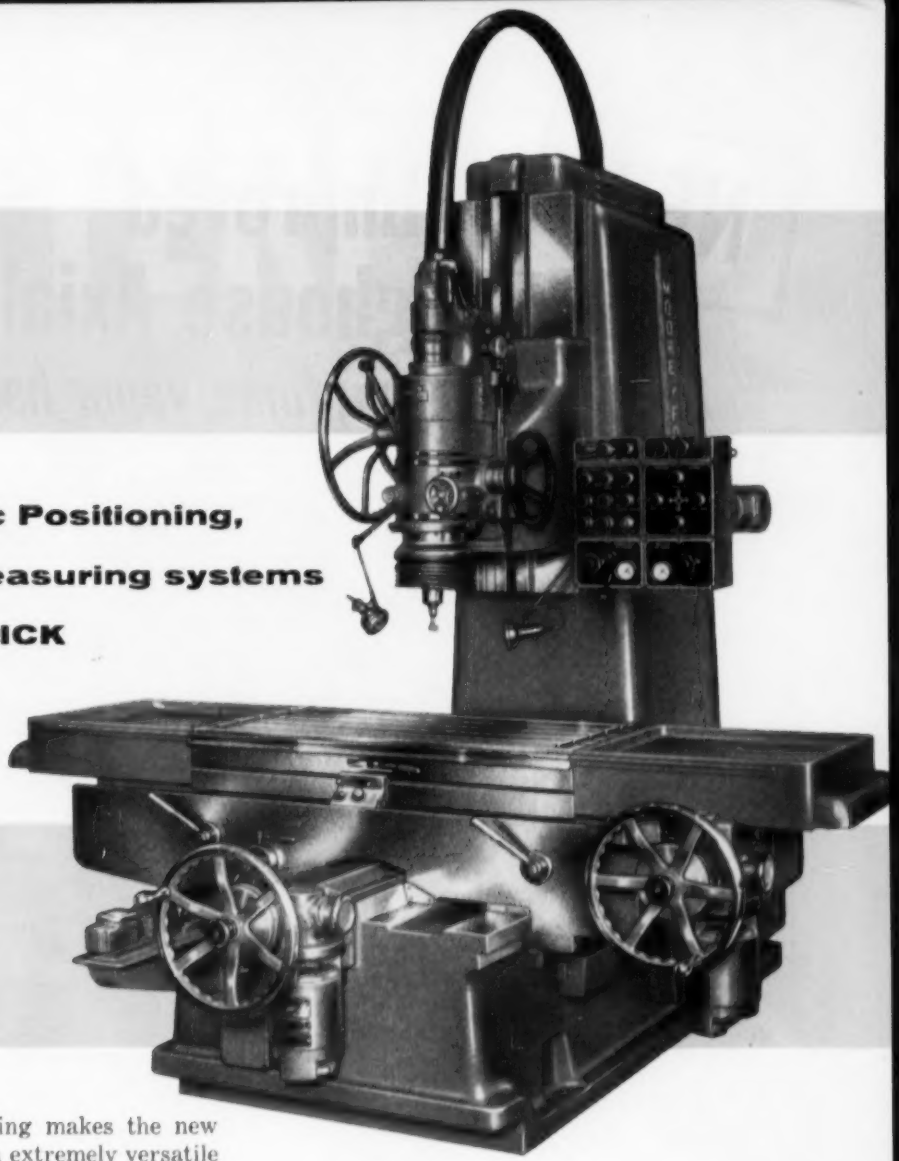
Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

NOW... Automatic Positioning, choice of two measuring systems on MOORE-FOSDICK Jig Grinder!



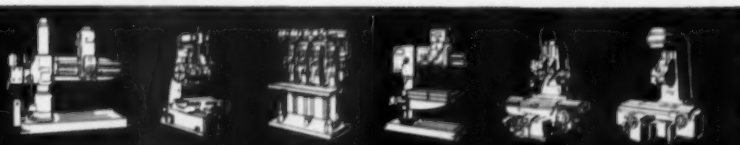
Exclusive automatic positioning makes the new Moore-Fosdick Jig Grinder an extremely versatile machine! Besides large work capacity (22" x 44" or 18" x 36" x 27" height) you get increased speed and precision. At the touch of a button, table and saddle position automatically to ± .0001"!

A choice of two precision measuring systems is available. With the new and exclusive Direct Dimension Measuring, dimensions from blueprint are simply set on direct-reading drum dials. The other system, Rod and Bar Measuring, employs measuring rods, micrometers, and for high production work, duplicating bars. Either measuring system may be installed with or without automatic positioning, but both systems cannot be installed on the same machine.

On the Moore-Fosdick Jig Grinder you can grind conical holes with taper in either direction, as well as cylindrical holes. An angular and indexing device built into the main spindle, and the recently developed slot grinding attachment, give quick, accurate grinding of any contour — *regular or irregular*. Write for price and delivery information.

Other outstanding features include: infinite range of grinding speeds—12,000 to 60,000 rpm, contour and chop grinding, spindle-housing heat control.

NEED JIG GRINDING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



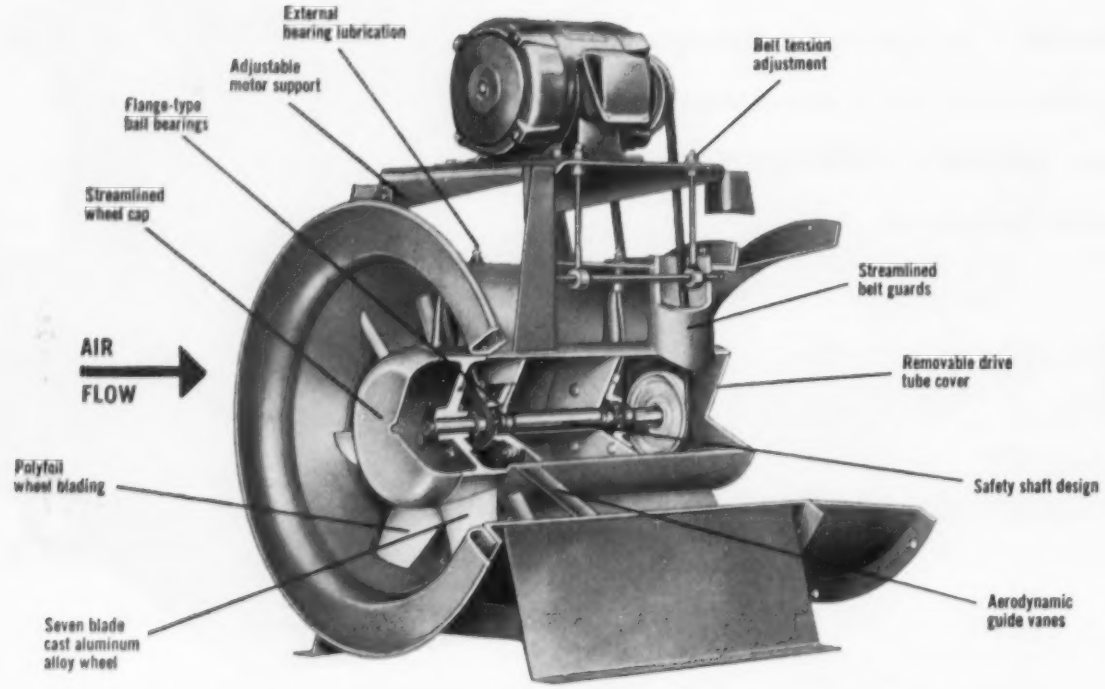
Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

NEW Improved Westinghouse Axial Flow Fans

for Industrial air, fume, vapor handling jobs!



CUTAWAY VIEW OF WESTINGHOUSE AXIFLO® VANEAXIAL FAN FOR GENERAL APPLICATION.

COMPLETE NEW LINE

With: volumes from 1,700 to 100,000 CFM—static pressures up to 3¼"—14 sizes, Vaneaxial or Tube Axial, direct-connected or V-belt driven, with wheel diameters from 15" to 72".

- **Space Saving** . . . compact Axial Flow design permits installation directly into duct work.
- **Improved performance** . . . non-overloading horsepower feature permits use of smaller motors.
- **Least maintenance** . . . rugged practical construction insures continuous trouble-free operation.

For complete application service, call your nearest Sturtevant Sales Engineer, or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 26F, Hyde Park, Boston 36, Mass.

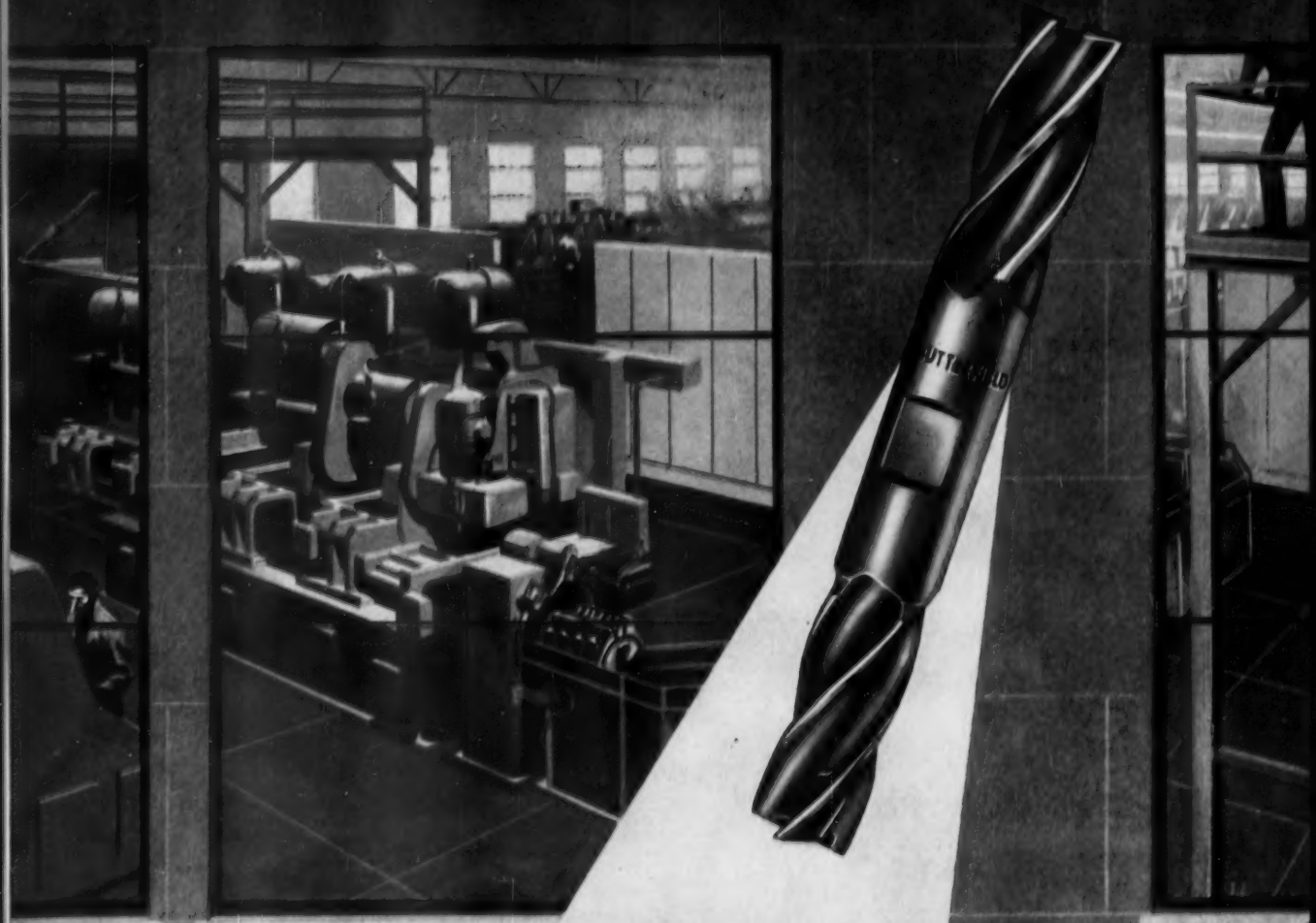
Spray booth Vaneaxial Fan specially designed to provide easy access required for paint spray exhaust!

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***

J-80592

BUTTERFIELD



The Butterfield tools you buy more than meet the quality control standards set for your product.

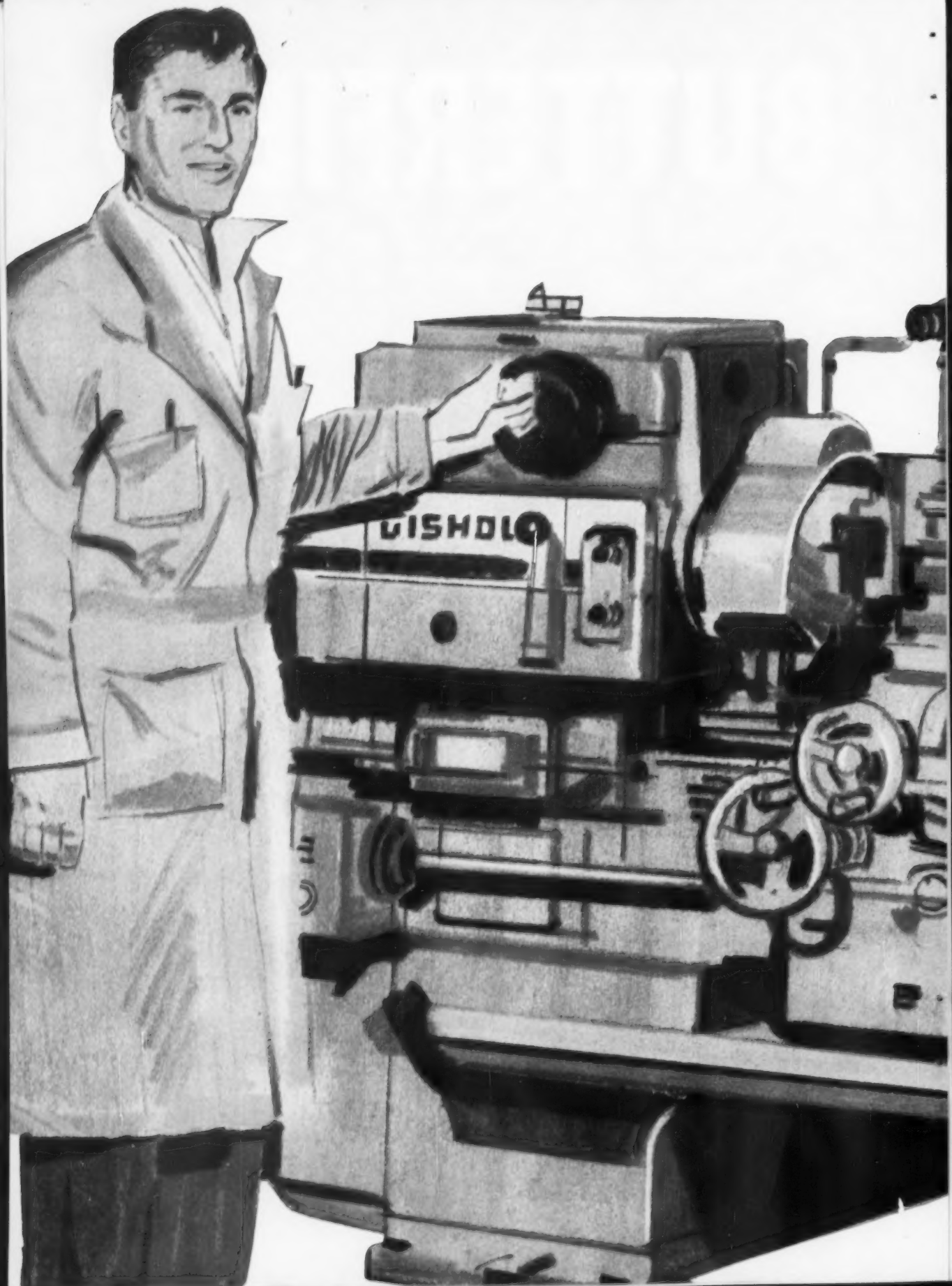
- Long Cutting Mileage
- Smoother Finishes
- Guaranteed Top Performance

UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U.S.A.

USE YOUR LOCAL BUTTERFIELD DISTRIBUTOR TO YOUR ADVANTAGE.
You get lower inventory costs, expert counsel and "hurry-up" service.

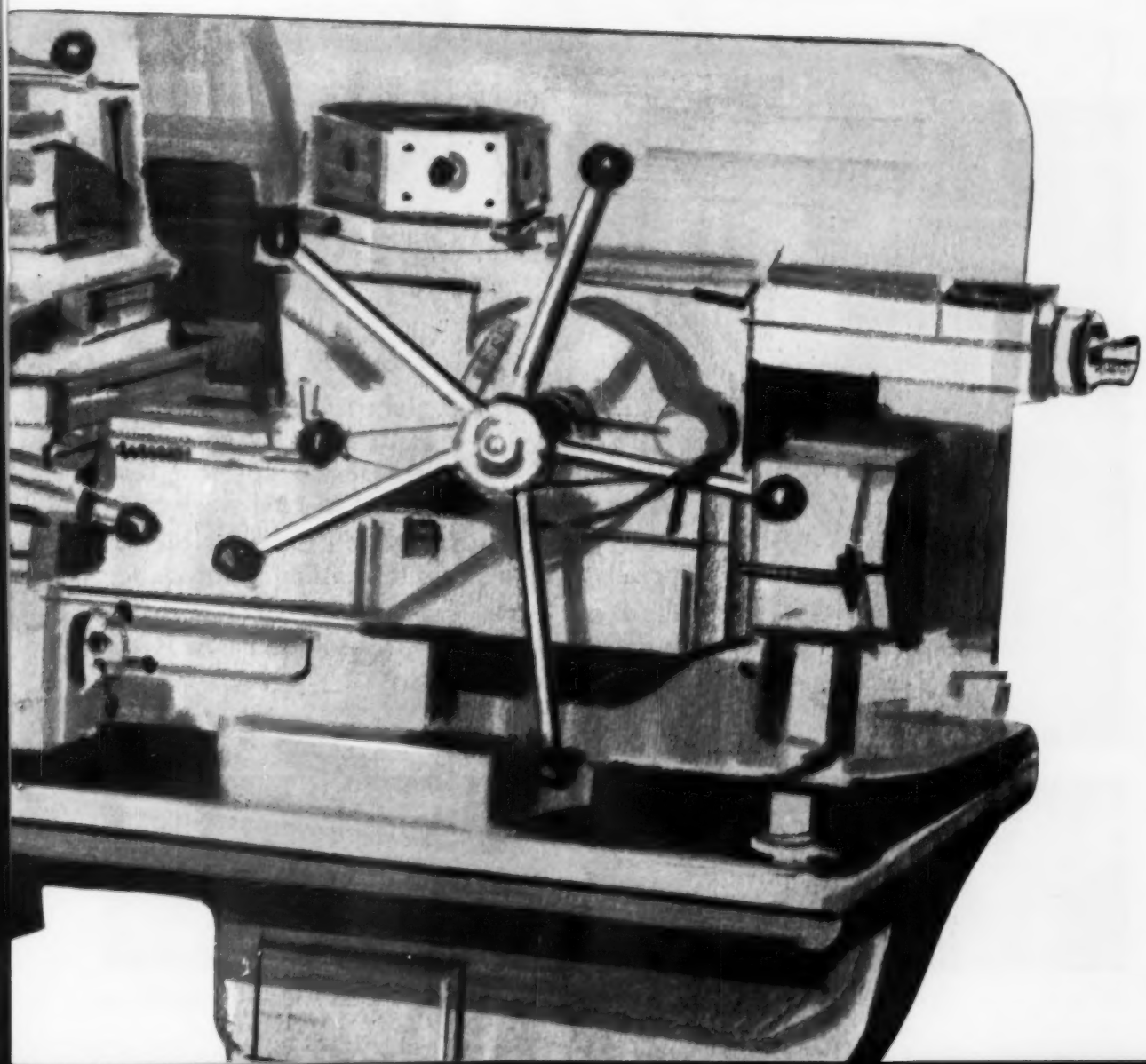

GISHOLO

GISHOLT MASTERLINE
RAM TYPE TURRET LATHE

Here is the latest Gisholt MASTERLINE Ram Type Turret Lathe, with many improvements and outstanding features to provide faster, easier operation, higher quality, quicker setup and lower maintenance. In short, it is designed to do your work faster, cheaper and better—and with a new minimum requirement for operator skill, attention and effort. Let us tell you more about these new machines, and discuss the possibilities of their profitable application to your particular manufacturing processes.

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt



SOCK

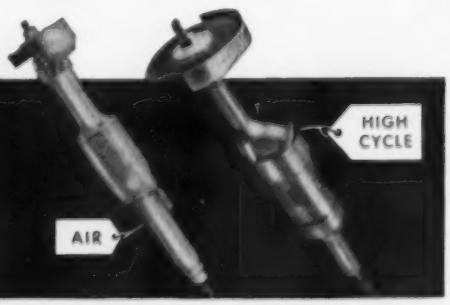
for the socket!

New Rotor J-2L Impact Wrench cuts time 23%

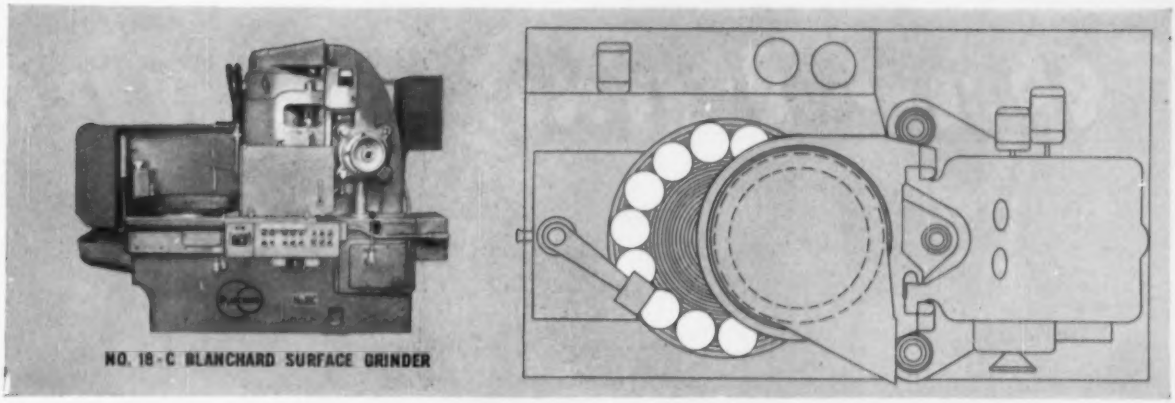
Formerly used electric nut setter for assembly of garden tools. Switch to Rotor J-2L Air-powered Impact Wrench cut job time 23%. Savings paid for tool in 12½ weeks.

New J-2L Impact Wrench is reversible . . . specially designed for minimum maintenance.

Find out how *you* can cut costs with the rugged, lightweight J-2L and other new Rotor Tools! Ask for Bulletin 41.



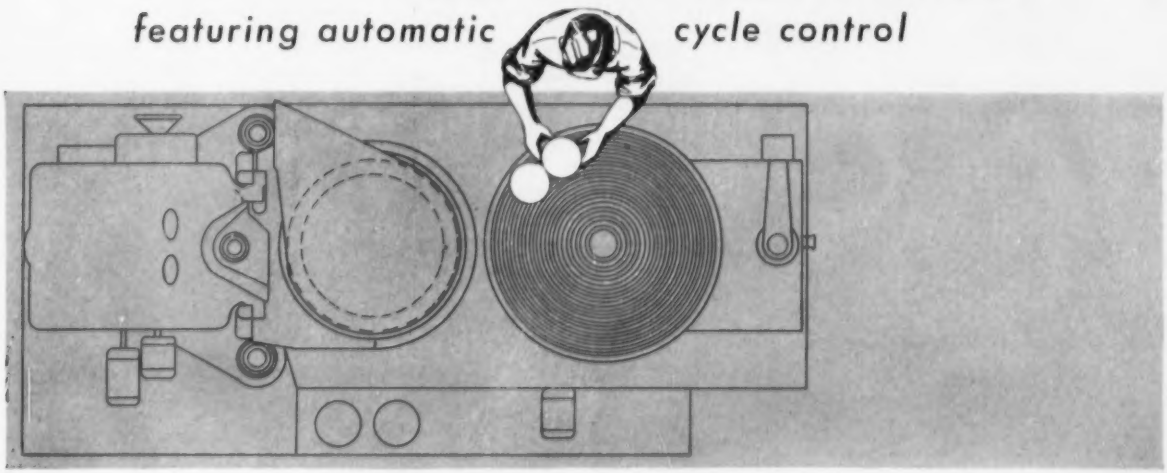
THE ROTOR TOOL CO.
CLEVELAND OHIO



NO. 18-C BLANCHARD SURFACE GRINDER

Plan for more profitable production with this new Blanchard Grinder

featuring automatic cycle control



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

The automatic cycle does everything else: moves chuck (30″ or 36″ dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

This new Blanchard offers you many new production advantages. Look into them today — write for free catalog showing work done on the No. 18-C.

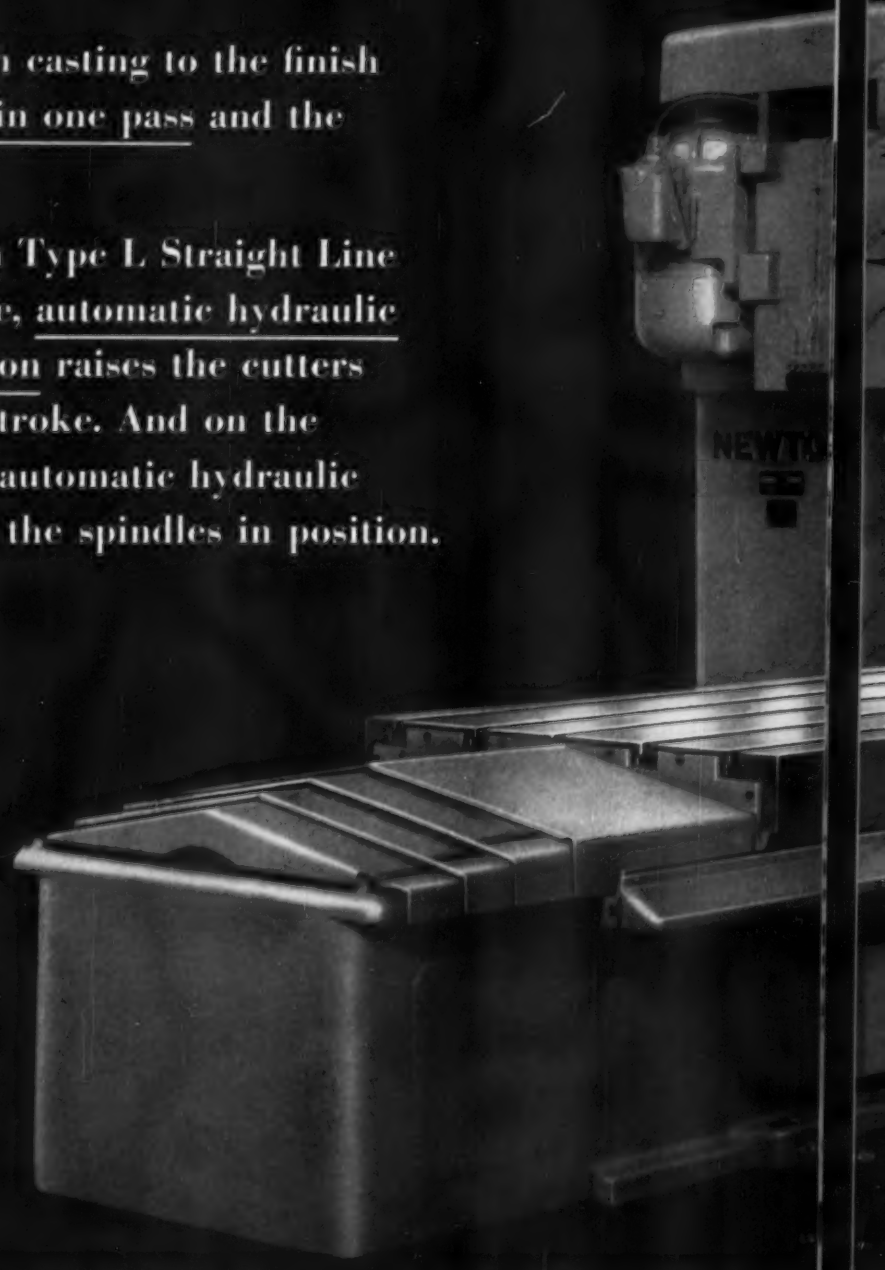
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

One Pass . . . and

From the rough casting to the finish milled surface in one pass and the job is done!

On this Newton Type L Straight Line Milling Machine, automatic hydraulic spindle retraction raises the cutters on the return stroke. And on the milling stroke, automatic hydraulic clamping locks the spindles in position.

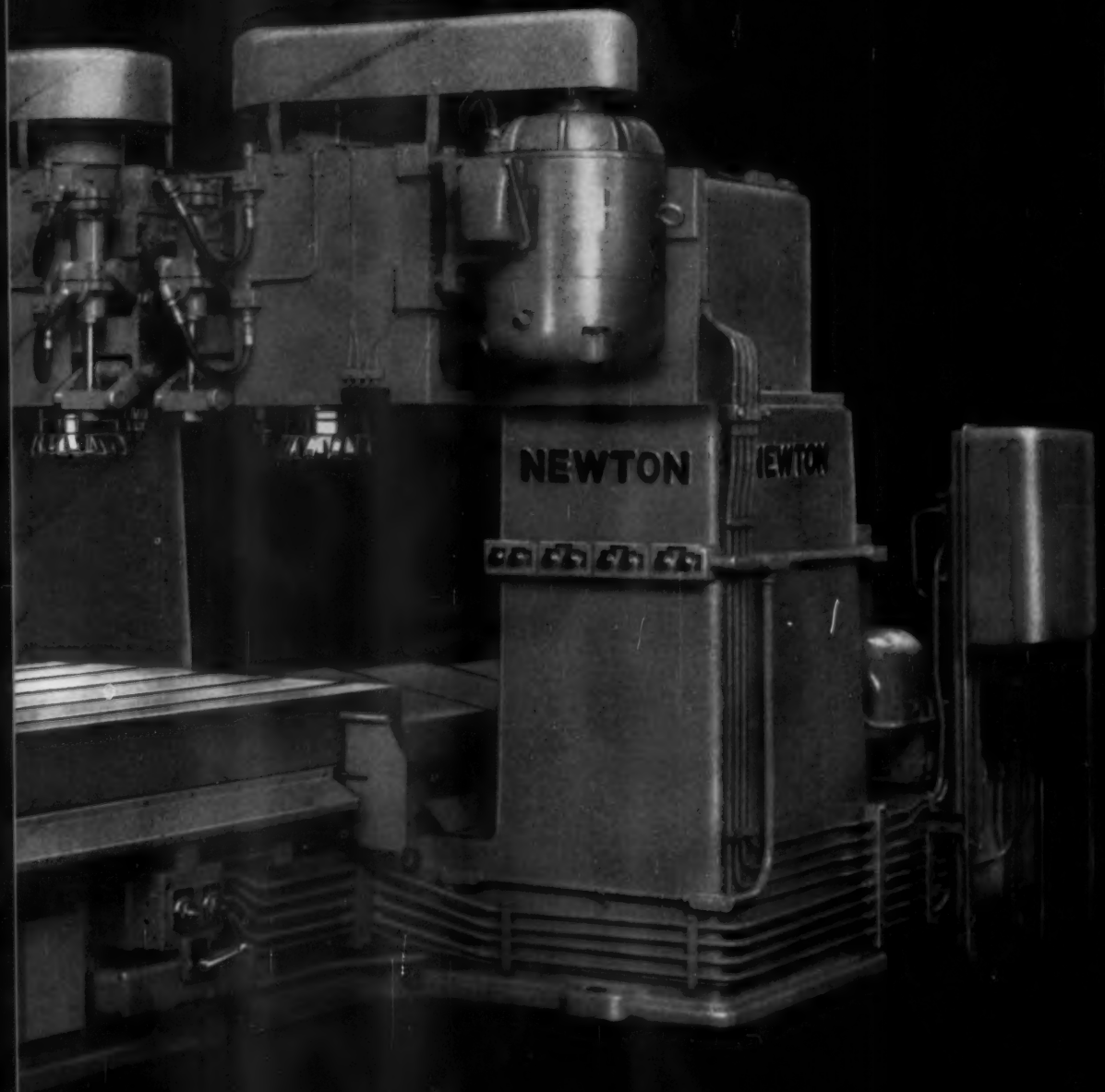


Newton Type L Straight Line Milling Machine with 20 H.P. heads for one-pass milling of aluminum crank cases.

CONSOLIDATED MACHINE TOOL

A Division of Farrel-

the Job is Done!



COMPANY, ROCHESTER 10, N. Y.

Birmingham Company, Incorporated

A WADELL FEATURE

automatic indexing to tenths

for high speed production, unexcelled accuracy and universal adaptability

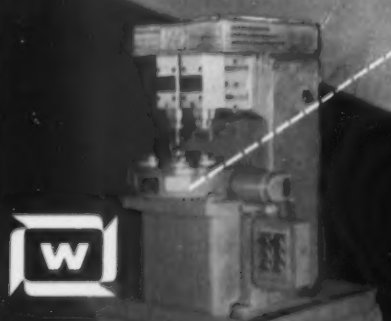
ALL ELECTRICAL OPERATION
Indexes and is controlled electrically. Automatic cut out shuts off machine power if index is not complete.

TAPERED ROLLER BEARING SPINDLE
Extra large size tapered bearings provide for thrust loads in all directions. The spindle is hollow allowing adaption of air or hydraulics to actuate chucks or other holding means.

TORQUE LIMITER DRIVE.
An exclusive Wadell development requires only three moving parts. Friction drive eliminates possibility of jam-up and allows manual retard of table index.

JIG BORED MASTER PLATE
Master plate is jig bored to attain maximum accuracy of index positions. Locking mechanism moves on preloaded rollers eliminating all play.

SIZES: 12" — 18" — 24"



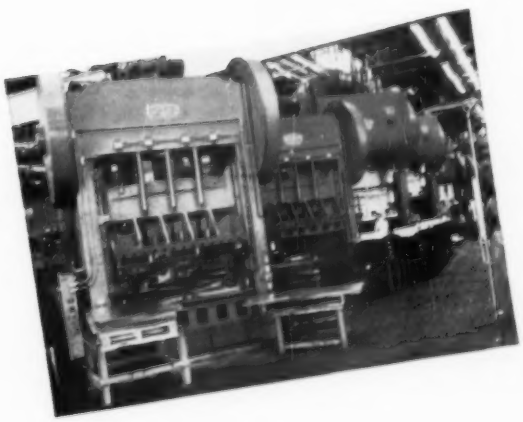
for further information write:

WADELL

EQUIPMENT COMPANY

119 SOUTH AVE. • GARWOOD, NEW JERSEY

new CLEVELAND Presses give you better stampings for less.



Chances are that your production lines are operating at full capacity. That's why it's most important to carefully check your present Press equipment. Worn, inefficient Presses are wasting your profits.

In the ever widening field of pressed metal products, new Cleveland Presses are used to advantage by cost conscious manufacturers. They've found their investment in new Presses is soon repaid by more accurate, dependable and economical production.

Whether you need one press or a complete battery, you'll find there's just the right Cleveland Press to keep your company in a competitive, profitable position; Cleveland Presses are built in a complete range of types and sizes, from small Open Back Inclinables to large Underdrives. All offer outstanding efficiency.

Whatever your needs may be, "why settle for less than a Cleveland Press". Be sure to get complete information on the (patented) Cleveland Drum Type Air Friction Clutch with spring loaded Brake. It reduces down-time . . . costs less to operate. Write or call today.

THE CLEVELAND PUNCH & SHEAR WORKS CO.

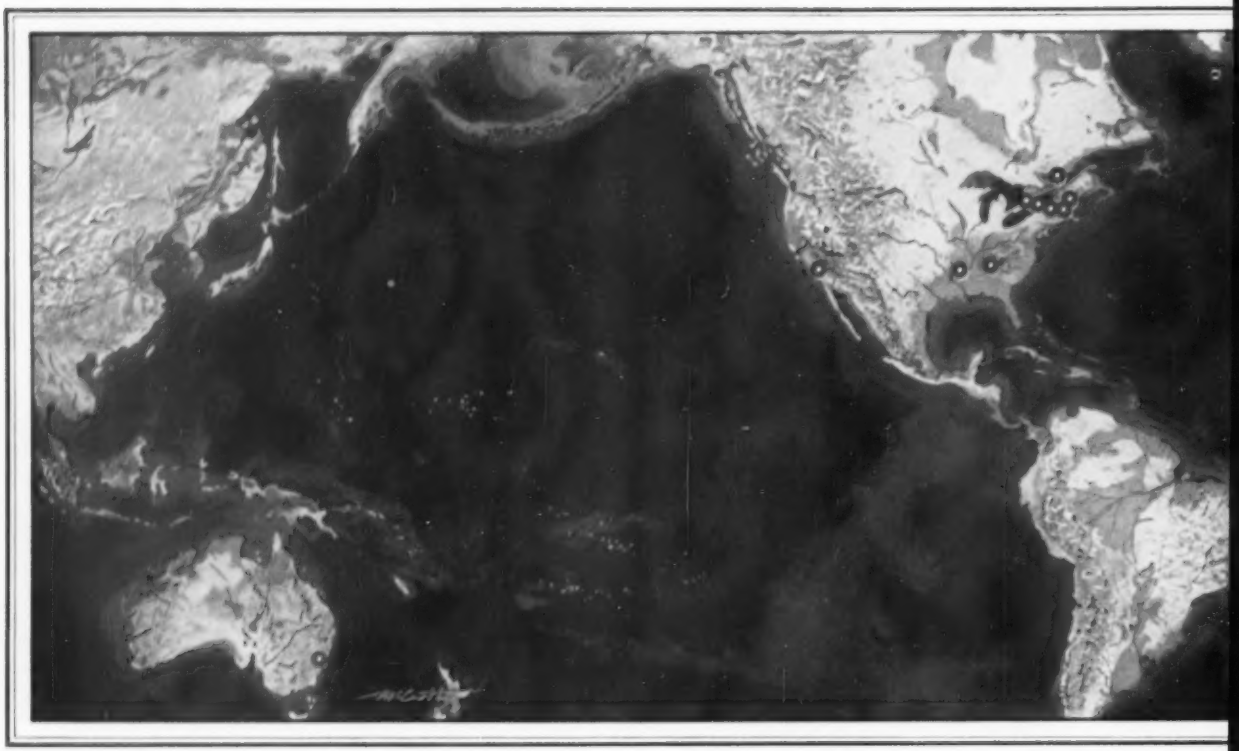
Established 1880

POWER PRESSES – FABRICATING TOOLS

E. 40th & St. Clair Avenue, Cleveland 14, Ohio

Offices at: NEW YORK • CHICAGO • DETROIT
PHILADELPHIA • E. LANSING

CITY FOUNDRY DIVISION · SMALL TOOL DEPARTMENT

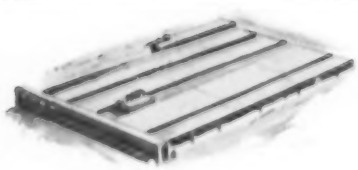


All industry shares

Ten new Norton Plants . . . in six countries . . . within seven years . . . tell a story of continuing, world-wide leadership

No industry can exist without abrasives. Even the very few industries that do not perform abrasive operations themselves — in manufacture and maintenance — depend upon them for the tools and equipment they use.

That is why every industry has a share — and a stake — in the growth of Norton Company. Norton owes its leadership in the manufacture and development of abrasive products to the high



1948 — Worcester, Mass. Plant No. 7 in "Norton City" is the largest, most modern ever built for grinding wheel manufacture. Here, revolutionary advancements in processing equipment and techniques produce grinding wheels of unequalled quality and uniformity.

1951 — Isando, Union of South Africa. Located in the Transvaal near Johannesburg, and serving all Africa, this Norton plant produces a complete line of abrasive products. Thus Norton anticipates the needs of a continent that, industrially, is just awakening.

1951 — Troy, N.Y. This new building at the Behr-Manning division produces waterproof coated abrasive paper for finishing car bodies. Through its single huge machine the strip of paper base travels nearly five miles while being coated with Norton abrasive grain.

Making better products...

Across the world and still expanding

Abrasive and Grinding Wheel Plants — Worcester, Mass.; Santa Clara, Calif.; Hamilton, Ontario; South Africa; England; France; Germany; Italy

Behr-Manning Plants — *Coated Abrasives and Behr-Cat Tapes* — Troy, N. Y.; Canada; Australia; France; Northern Ireland; Argentina

Electric Furnace Plants — Huntsville, Alabama; Chippawa, Ontario; Cap-de-la-Madeleine, Quebec

Grinding and Lapping Machine Plant — Worcester, Massachusetts

Refractories and Electro-Products Plant — Worcester, Massachusetts

Norton Pike Plant — *Sharpening Stones* — Littleton, New Hampshire

Bauxite Mines — Bauxite, Arkansas

Main Office: Norton Company, Worcester, Mass.

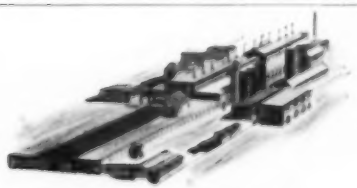
in this steady growth

confidence it has built up among its customers all over the world.

This confidence can be measured — and the yardstick is growth. Steady growth since 1885, not only in this country but in many others. In the last decade alone the expansion of Norton Company has been extensive and rapid. Shown here are Norton plants built in the United States, Canada and the Union of South Africa since 1948. In addition, other new plants have been built in Australia, France and Northern Ireland.

NORTON
ABRASIVES

*Trade Marks Reg. U. S. Pat. Off. and Foreign Countries



1953 — Cap-de-la-Madeleine, Quebec, Canada. Located in a region rich in mineral resources, this electric furnace plant produces CRYSTOLON* silicon carbide for abrasive and refractory uses. Norton's largest plant of this type is in Chippawa, Ontario.

1955 — Santa Clara, California. The better to meet the needs of the rapidly expanding West Coast market, this Norton plant manufactures a full line of grinding wheels, including diamond wheels. Norton is first to supply this complete West Coast service.

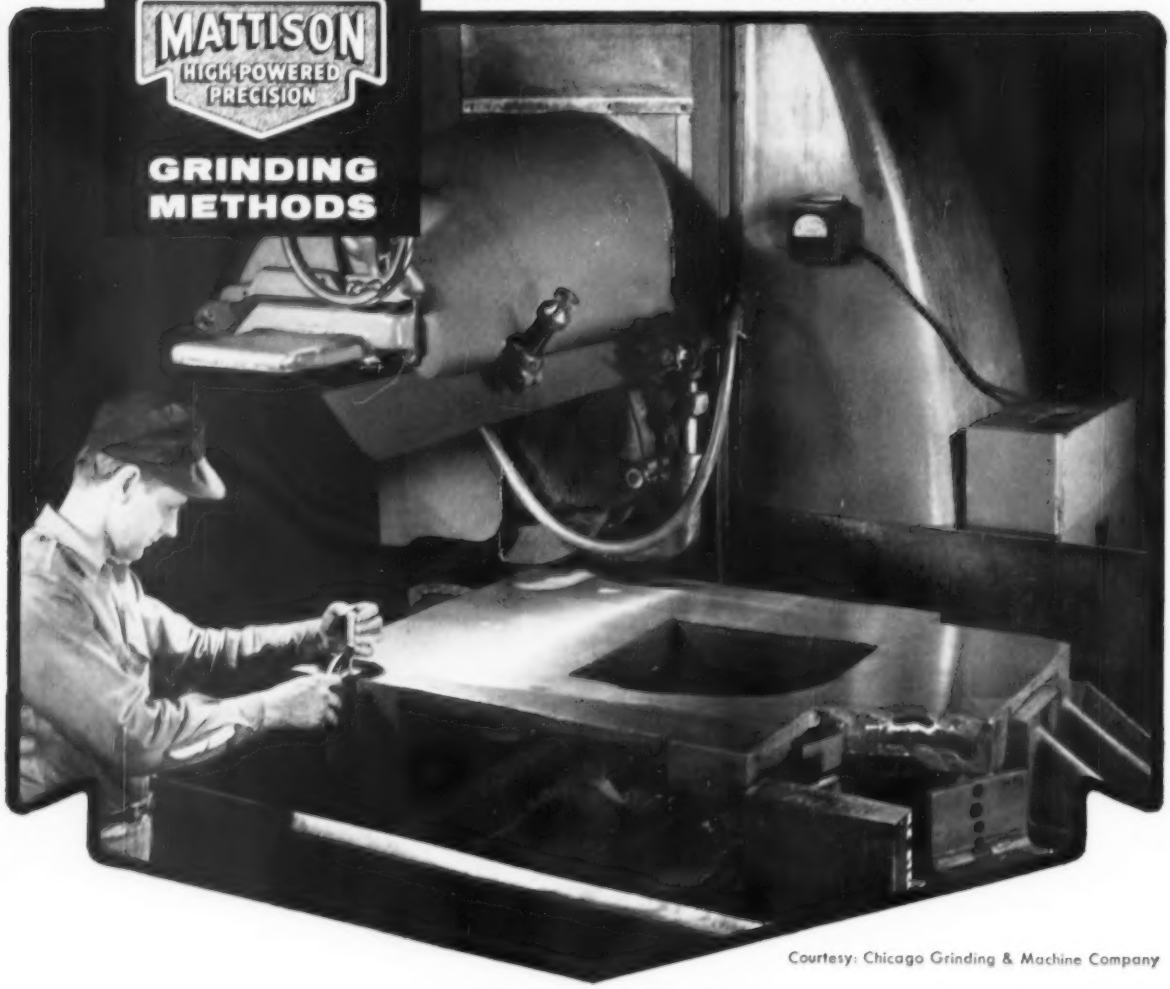
1955 — Huntsville, Alabama. This latest addition to the Norton international network is another electric furnace plant. Besides supplying NORBIDE* boron carbide, MAGNORITE* fused magnesia and fused stabilized zirconia, it will produce special products for the AEC.

to make your products better

CASE HISTORY NO. 24—LARGE MACHINE ENDS

MATTISON
HIGH-POWERED PRECISION

GRINDING METHODS



Courtesy: Chicago Grinding & Machine Company

How versatile skills of "Mattison-Equipped" subcontract shops can help you!

Production of precision oil seal rings is 100 per hour. Depth of countersink must be held within close limits.

Chicago Grinding and Machine Company, Chicago, Illinois, is one of hundreds of small plants using Mattison Surface Grinders for precision machining of subcontract parts. Starting with their first "Mattison" in 1939, this company now has three No. 36 Vertical Spindle Rotary Surface Grinders and one High-Powered Horizontal Grinder—machines which permit handling diversified operations accurately and fast.

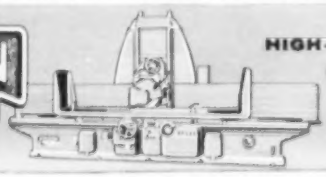
Jobs illustrated here prove the unusual versatility of Mattison Surface Grinders—versatility resulting from extra-heavy construction, high power, and simplicity of adjustments.

Large machine ends, above, are ground top and bottom in six hours, each, removing ½ in. stock. Parallelism over 47 in. dimension is held within .0015 in. Flatness and size are held within .005 in. Massive, double-column construction permits operator to "hog off" stock with maximum efficiency.

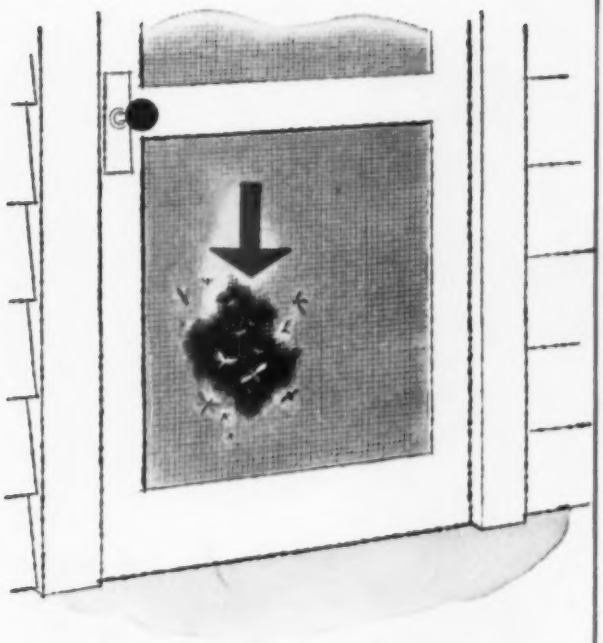
At the left, the "No. 36" grinds two sides of precision retainer rings at the rate of 100 per hour, holding size to plus .000 minus .003 in. Power and rigidity permit grinding these parts accurately, at a high rate of production.

Hundreds of "Mattison-equipped" subcontract shops like this one can put their special grinding skills to work solving your "trouble" jobs.

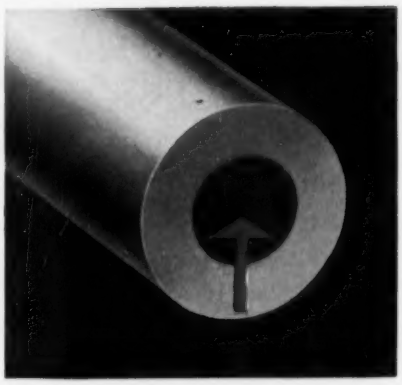
MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS



a hole here is a nuisance...



a hole here is convenient

Crucible Hollow Tool Steels eliminate the nuisance of drilling, boring, cutting-off or rough-facing of ring-shaped, tubular or bored tool steel parts. They save you money, too, by reducing machine time and scrap losses.

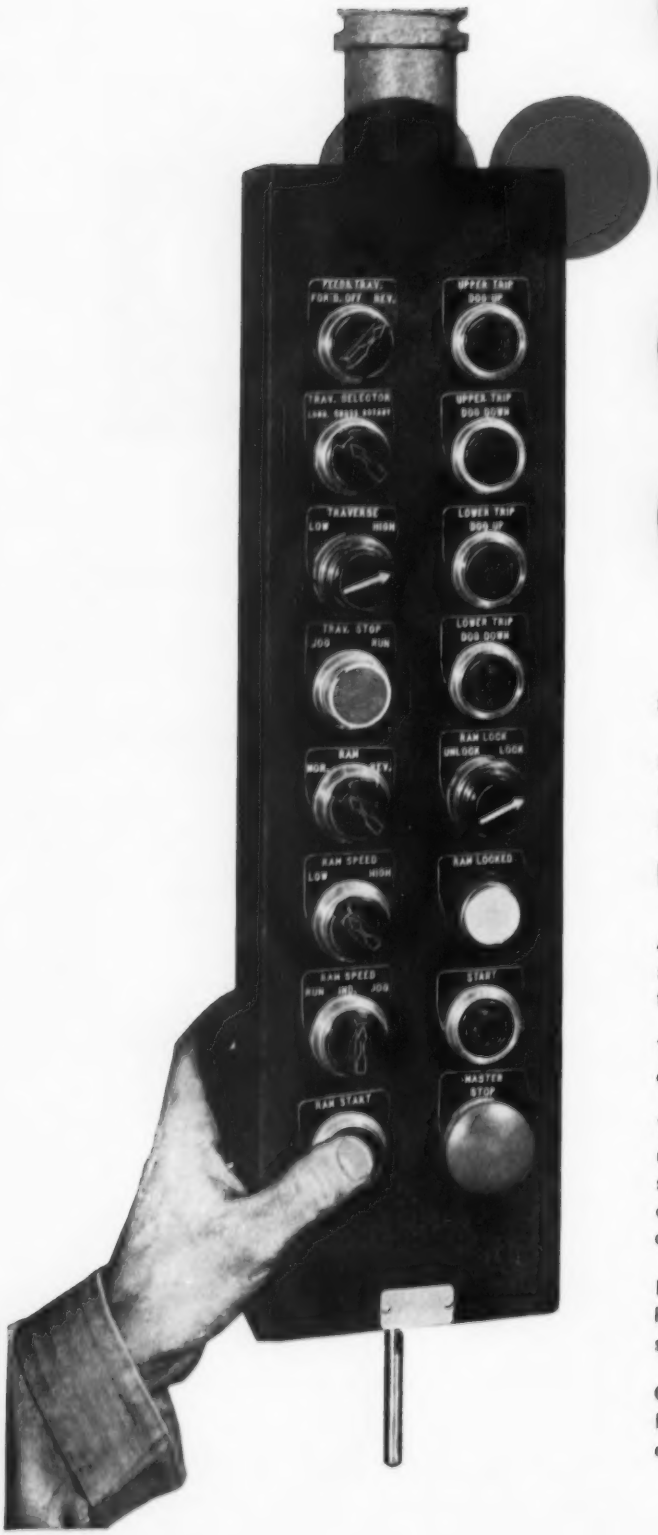
Crucible Hollow Tool Steels are produced in all of the famous Crucible tool steel grades . . . in bars or saw cut lengths to meet your needs. And they're available in almost any combination of O.D. and I.D. sizes. You can get these five grades "off the shelf" from your local Crucible warehouse: KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot work.

See how Crucible Hollow Tool Steel Bars will save you hours of shop time. Call your Crucible representative. *Crucible Steel Company of America, The Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



push button control

speeds operation and set-up on new Rockford **hydraulic** slotter

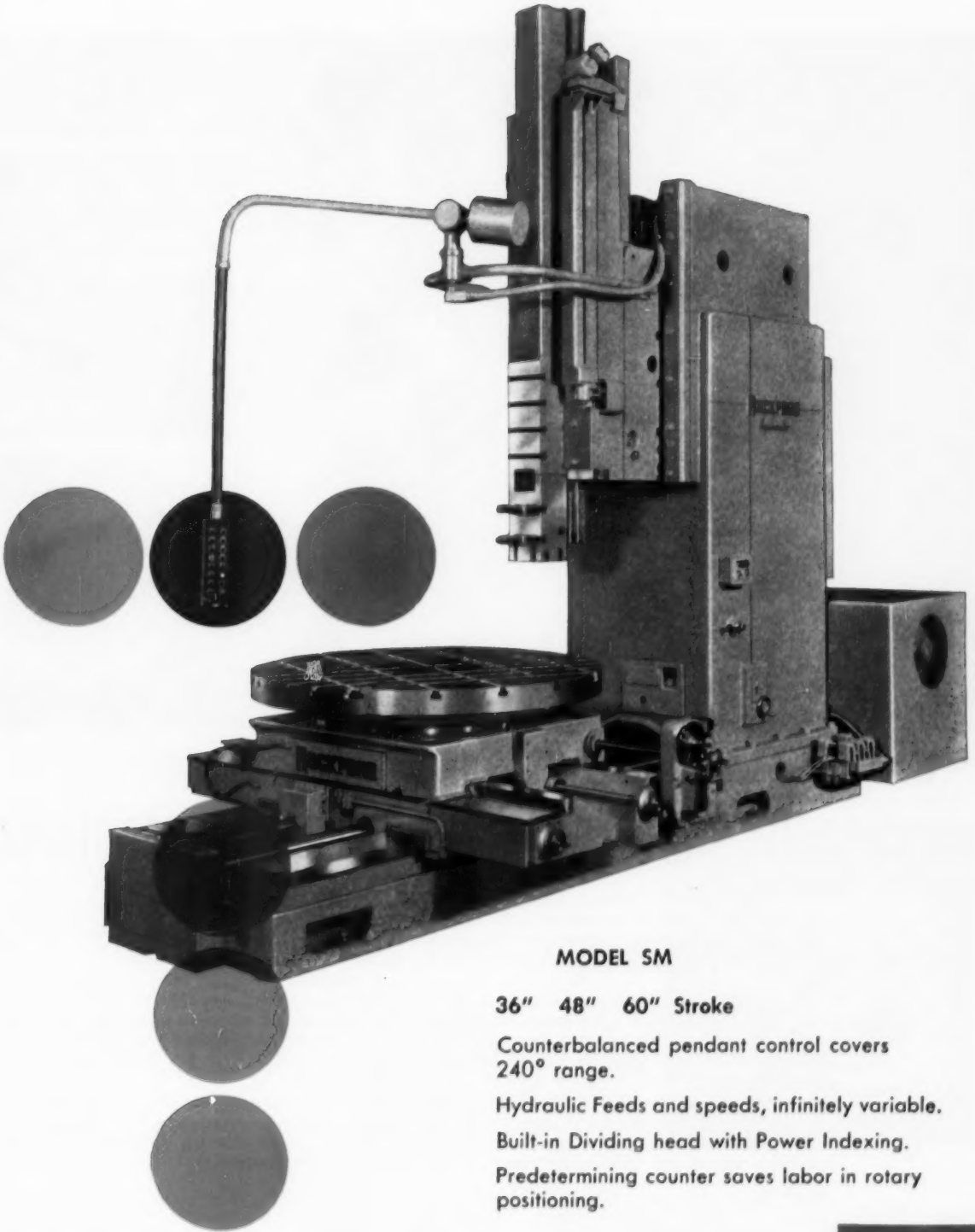
All longitudinal, transverse and rotary movements are selected and operated from the push button station of this new Rockford hydraulic Slotter.

The ram lock is pendant operated and ram stroke length and position are completely push button controlled.

Two-speed table traverse is available, enabling the machine operator to position the work to a few thousandths, without manual movements, although manual control of all movements is available from either side of the machine.

Full hydraulic drive provides two cutting ranges, one for high speeds and low cutting forces; the other for slow speeds and heavy cuts.

Get full details on this new hydraulic slotter from any Rockford Machine Tool Co. representative, or write directly to us.



MODEL SM

36" 48" 60" Stroke

Counterbalanced pendant control covers 240° range.

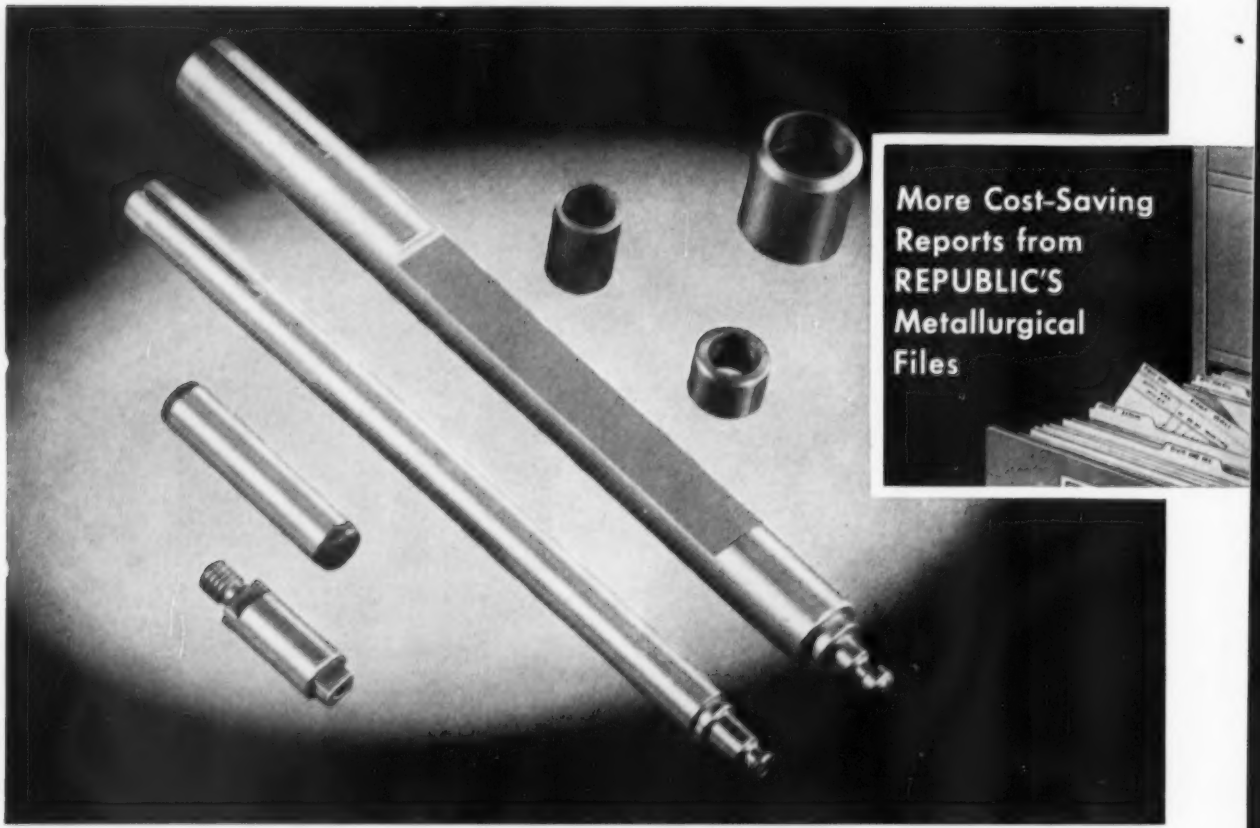
Hydraulic Feeds and speeds, infinitely variable.

Built-in Dividing head with Power Indexing.

Predetermining counter saves labor in rotary positioning.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

HYDRAULIC



...the right metal in the right place provides

MACHINABILITY, STRENGTH, TOUGHNESS, CORROSION-RESISTANCE

These are four good reasons why the manufacturer of the carburetor parts shown above uses Free-Machining ENDURO Stainless Steel Bars.

His product must resist corrosion. It must resist wear and abrasion. It must have high tensile strength. And he must have machinability at a cost that permits him to be competitive.

Free-Machining ENDURO Bars fill the bill on every count. Here is a metal unsurpassed in high physical and chemical properties to which has been added the advantages provided by cold drawing—accuracy of section, close tolerance, uniform soundness and a fine surface finish.

If you make stainless steel parts or contemplate making them, Republic can meet your bar requirements. In addition to a complete range of analysis in cold finished form, Republic also supplies ENDURO® in hot rolled bars, special sections and wire.

Republic metallurgists and machining specialists will give you expert, obligation-free assistance on application, processing and use. Just send the coupon.

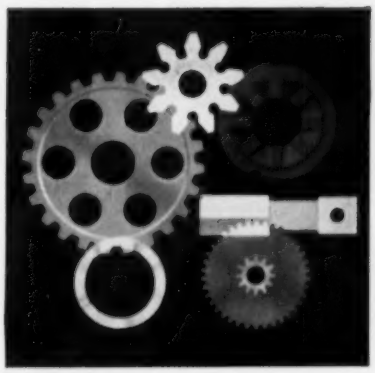
REPUBLIC

REPUBLIC STEEL

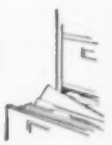
World's Widest Range of Standard Steels

Republic Iron Powder offers you new profit opportunities in small parts production.

Parts can often be made faster, more uniform and at less cost using Republic Iron Powder. It is also being used successfully in making complicated shapes which are difficult to produce economically by other means. Republic metallurgists and engineers, with a thorough knowledge of all types of metals, can help you determine iron powder's suitability to your parts production. Or, they can suggest alternate methods or materials better suited to your particular needs. This service is available without cost or obligation. Just mail the coupon.



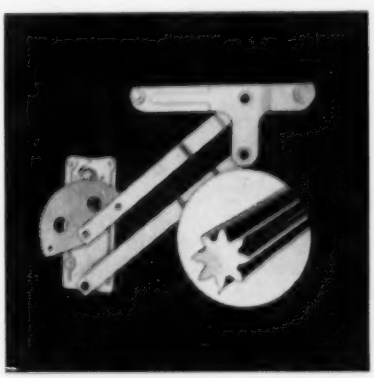
Republic Alloy Steels help manufacturer build giant earth mover to carry heavier loads at higher speeds.



The manufacturer, faced with a strength-weight problem, contacted Republic. After careful consideration of all factors, two analyses of Republic Alloy Steel were recommended and adopted for drive pinions, reduction and ring gears and the transfer case pinion shown right. These fine steels provide the manufacturer with the highest strength values—plus an unusually high strength-to-weight ratio that permits transmission of hundreds of horsepower through tough, strong gears and shafts free from excess weight. Republic will help you apply these versatile steels to your product.

Republic Cold Drawn Special Sections reduce machining on window gear to two simple operations.

The only machining operations required are cutting-off and drilling. The manufacturer uses Republic Cold Drawn Special Sections preformed to the predominating cross section of the gear. Special sections provide almost limitless flexibility in design. They permit replacement of costly assemblies with one-piece shapes. They simplify built-up, interlocking or associated parts. Higher strength, greater surface hardness and a bright, smooth finish are additional benefits of the cold drawing process. Republic Special Sections are made to specification in all grades of carbon, alloy and stainless steel.

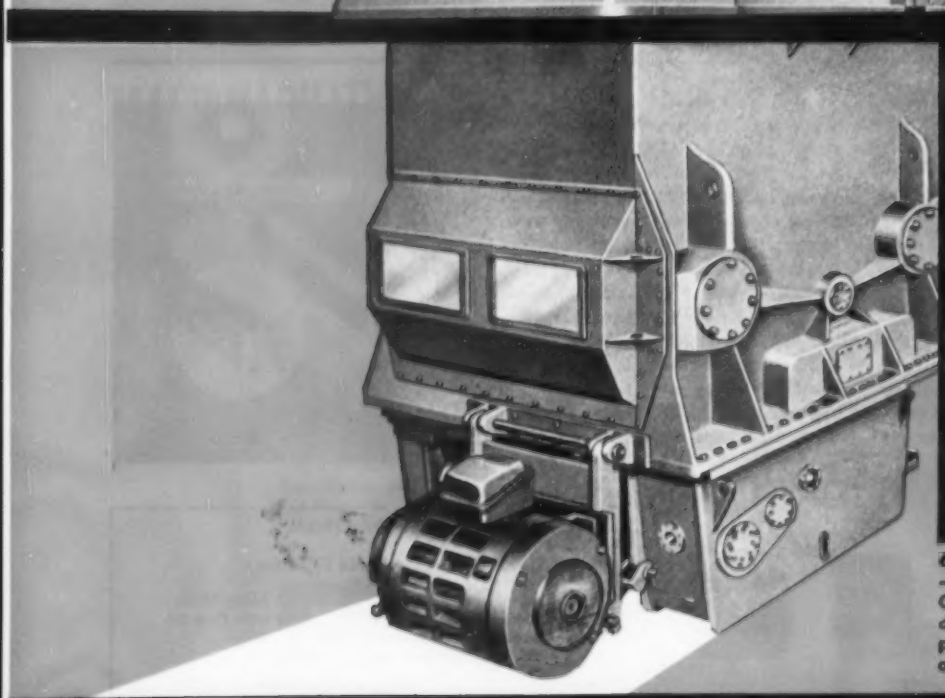


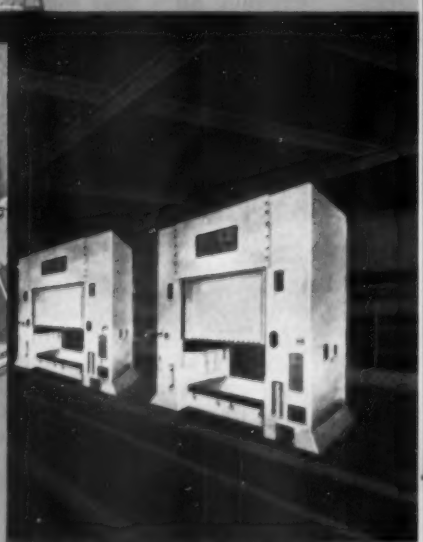
STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1999
3102 East 45th Street, Cleveland 27, Ohio
Please send more information on:
☐ Free-Machining ENDURO Bars. ☐ Alloy Steels
☐ Cold Drawn Special Sections ☐ Iron Powder
I am also interested in the services of a Republic
☐ Metallurgist ☐ Machining Specialist
Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

Now A NEW BLISS PRESS





600-TON PRESSES IN ASSEMBLY —Shown in assembly at Bliss' Canton, Ohio plant are these three underdrive presses. More than half of each press is beneath floor level. Note observation "ports" in the uprights.

COMBINES LINK-TYPE MECHANISM WITH *Underdrive*

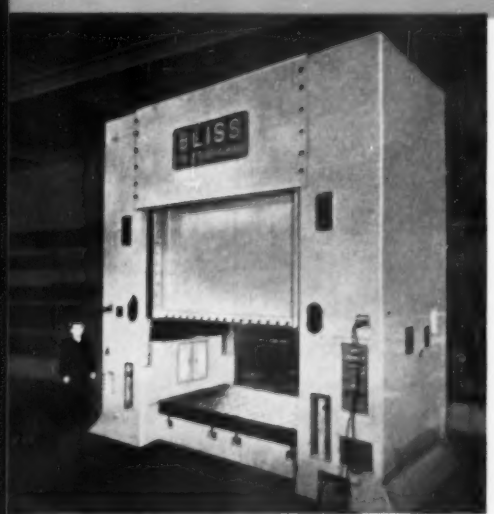
ROCKSHAFT IN NEW UNIT PROVIDES MAXIMUM PRESSURE ON DIES WITHOUT COMING TO BOTTOM DEAD CENTER

A completely new development in press design now offers press users the famous Bliss link-type drive in a low-slung "pull-down" press. The reduced headroom required makes the new press ideal for installation in modern one-story plants.

The link-drive rockshaft mechanism has been designed to come to within a few degrees of bottom dead center when the slide is down. This develops maximum pressure on the dies and eliminates a major cause of sticking.

Bliss engineers evolved the new design from the link-type overdrive press, which Bliss developed and introduced two decades ago. The "non-sticking" advantage of the new press is only one of the reasons why many have already been ordered by automotive manufacturers. Built to J.I.C. standards, these "packaged" units have all piping and wiring for press controls, automatic work-handling devices and maintenance tool power outlets built into their trim, rugged uprights. Installation is simply a matter of "plugging in" electrical and other connections. Adjustment is fast and precise, thanks to the motorized worm and wheel adjustment at all corners of the slide.

These are just a few of the many design features which make Bliss' Link-Type Underdrive presses among the most modern in the world. You ought to have the complete story in your files—and *can* by writing today to our Canton office.



THESE DESIGN ADVANTAGES SLASH OPERATING AND MAINTENANCE COSTS!

- Slide gibs protected against dirt and grit in all positions of stroke and adjustment.
- Swivel mounting on counterbalance cylinders eliminates misalignment of piston rod and cylinder.
- Packaged clutch and brake unit: standardized and unitized; gear type coupling between clutch and brake unit and press.
- All main drive gearing located in single removable gear case.
- Automatic lubrication of counterbalance cylinders and cushion internals.
- Plexiglass observation windows in uprights and gear case permit easy inspection of mechanism during operation.
- Two lubrication systems—one low pressure, the other high pressure; both interlocked with the press run circuit.

E. W. BLISS COMPANY, Canton, Ohio

Presses, Rolling Mills, Rolls, Special Machinery

BLISS
SINCE 1857

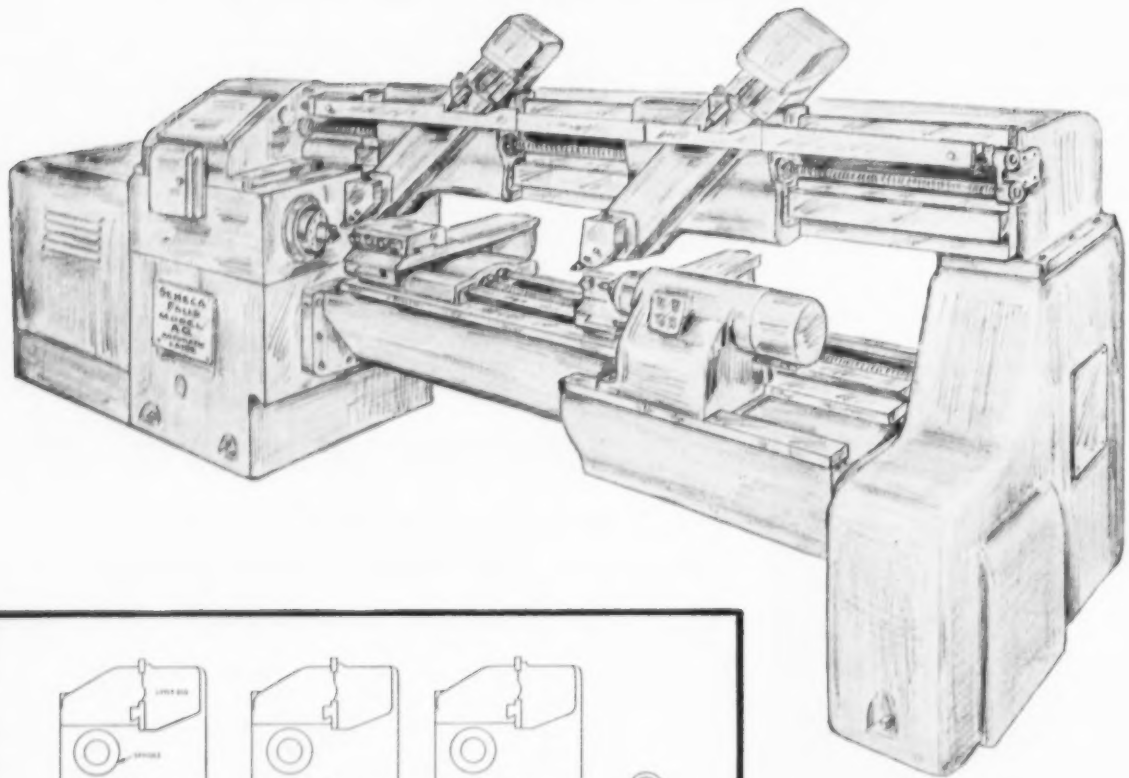
is more than a name... it's a guarantee

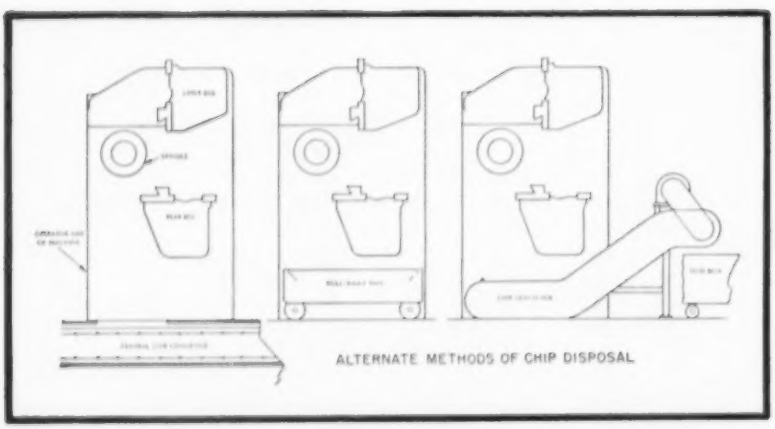
U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif. Branch Offices in Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. Other representatives throughout the world.

MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS





ALTERNATE METHODS OF CHIP DISPOSAL

SENECA FALLS
MODEL AQ AUTOMATIC
LATHE, 60 H. P.
NET WT. 20,080 LBS.
ALSO
MODEL LQ. 30 H. P.
NET WT. 8,900 LBS.

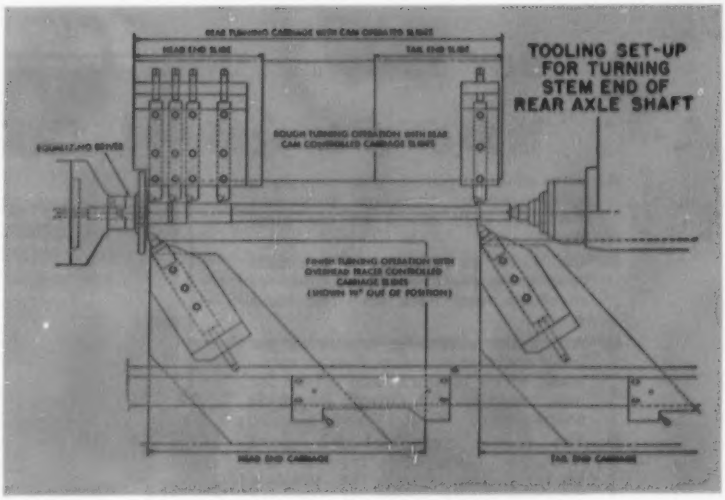
NEW SENECA FALLS

THE MONTH

● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The roughing operation is accomplished with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic... the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.



A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

WRITE FOR BULLETIN AX 56A

DESIGN FEATURES

- ▶ Simplified changeover features for reduced set-up time.
- ▶ Feed rate may be automatically changed during cutting cycle.
- ▶ Streamline design for efficient chip guarding.
- ▶ Screw feed to all carriages.
- ▶ Four speed head with automatic change-over.
- ▶ Large chip flow area.
- ▶ All templates clear of chip area.
- ▶ All ways hardened, ground and replaceable.
- ▶ Open front design facilitates loading and unloading.
- ▶ Straight line diameter adjustment for tracer tools...no shoulder length change to correct.

MODEL LQ AND AQ AUTOMATIC LATHES

Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cut-off from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

THE MARVEL NO. 6A AND 9A HEAVY DUTY HACK SAWING MACHINES

A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.

B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.

C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.

D. Use a non-breakable high speed hack saw blade—the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.

E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.

If you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.

Formula for Accuracy in Metal Sawing:
ACCURACY = (Length, Straightness, Squareness)
(Straightness, Squareness) = (Blade Rigidity, Blade Tautness)
MARVEL
HIGH-SPEED EDGE
ARMSTRONG BLUM MFG. CO.
CHICAGO 22 MADE IN U.S.A.

Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL-High-Speed-Edge Hack Saw Blades and Hole Saws.

The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts **any** machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively **unbreakable.** These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

Acme-Gridley

fully automatic turret lathe . . . gives you increased production in inverse ratio to cost

This customer chose a model MR Acme-Gridley to produce this packing gland nut, because he was able to increase his production by more than 3 times that of the former method.

The Acme-Gridley automatically controlled cycle is predetermined to give the minimum time per piece, on *every piece*. Because each tool-slide is independently cammed and selective spindle speeds are automatically controlled, machining can be done at the surface speed best suited for required finish and tolerance.

WRITE today for your free copy of new Bulletin MR-56. See why Acme-Gridley Basic Design lets you increase production and lower unit costs.

JOB FACTS

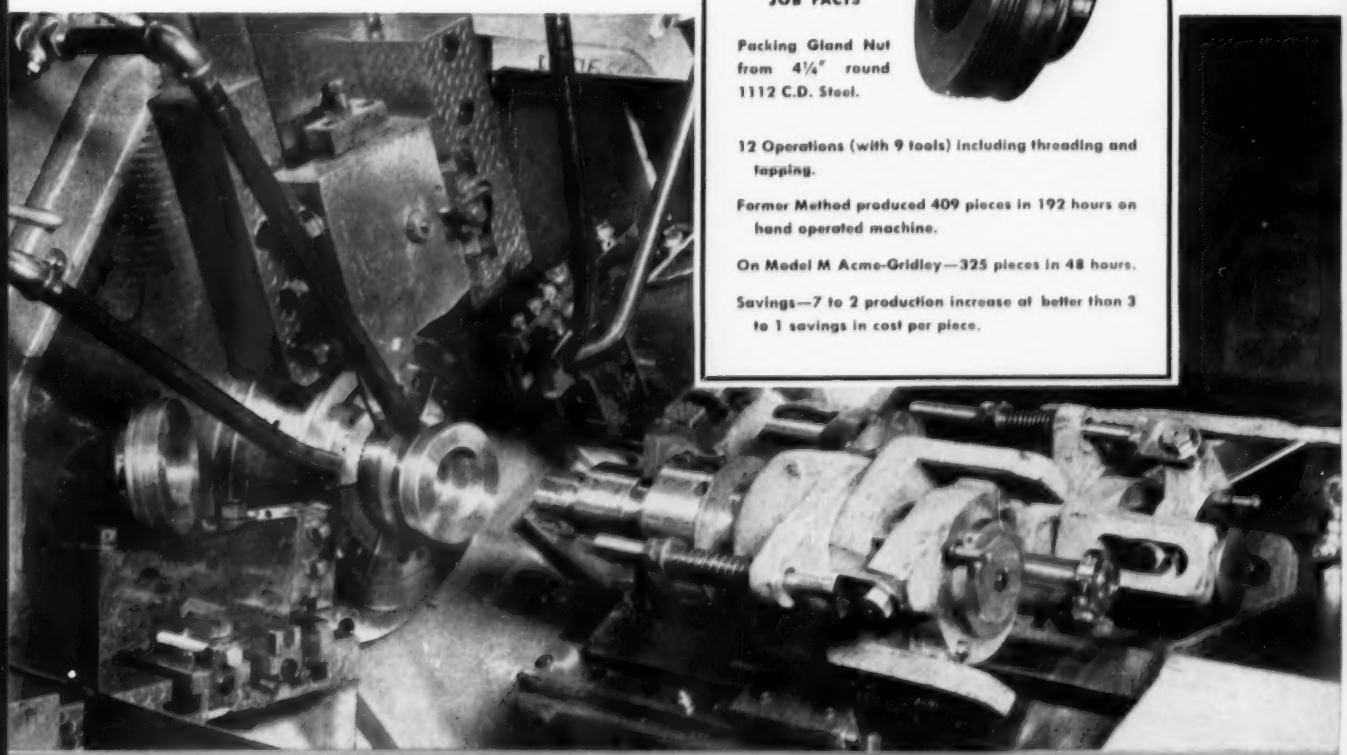
Packing Gland Nut from 4¼" round 1112 C.D. Steel.

12 Operations (with 9 tools) including threading and tapping.

Former Method produced 409 pieces in 192 hours on hand operated machine.

On Model M Acme-Gridley—325 pieces in 48 hours.

Savings—7 to 2 production increase at better than 3 to 1 savings in cost per piece.



National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

ACME-FETTE thread rolling costs are now as low as $0.00005 per piece — see ad on following page → → →

PERFORMANCE FIGURES WITH Acme-FETTE

thread rolling
now look even better!
would look good in any shop!
THE NATIONAL ACME COMPANY
RIGHT ON SCHEDULE! 4 months and another 1,000,000 pieces later, the original set of rolls are still on the job. Have you taken a close look at your threading picture lately?
THE NATIONAL ACME COMPANY
OUR JOB: to provide the Right Machine for YOUR JOB

Be sure to get Acme-FETTE figures on your threading jobs

THREADING COSTS NOW DOWN TO $0.00005 PER PIECE

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

See ad on preceding page — how ACME-GRIDLEY fully automatic turret lathe increases production in inverse ratio to cost

now available in commercial quantities

new high strength

OXIDE cutting tool

STUPALOX

Cuts cast steel, cast iron, chilled iron, carbon steel, high-speed steel, non-ferrous metals

Performance up to ten times the speed and four times the wear-resistance of other tools

for example

High-Speed Steel In machining high speed steel (207-B annealed) with hardened high speed steel tools, cutting speed was from 80 to 100 sfpm. Stupalox provided a cutting speed of 505 sfpm with .023" feed and .125" depth of cut.

SAE 1035 Steel SAE 1025 steel was cut with tungsten carbide tools at a speed of 250 to 350 sfpm. Stupalox cut the same material on the same machine at 1175 sfpm. Feed was varied from .015 to .005 and the depth of cut from .005 to .250 to demonstrate the tool's versatility.

* * *

STUPALOX is the result of thirty years of development of special-purpose oxides, by Stupakoff, one of the country's leading manufacturers of technical ceramic products. Stupalox tools are available *now*, in commercial quantities, and in a variety of sizes and shapes. Write for complete information and technical data.

SEND FOR DESCRIPTIVE BULLETIN NO. 156

Stupakoff
Division of
LATROBE, PENNSYLVANIA

The CARBORUNDUM Company

New P&H Constant Voltage Welders Offer

BIG SAVINGS

... save hundreds of dollars in installation and wiring costs... reduce power consumption

P&H Constant Voltage Welders are easier to operate and give you better welds. You get instant starting and recovery even on tack welds, or areas of poor fit-up. They let you select the arc voltage you desire. Voltage remains constant during the entire welding cycle to give you a uniform rate of deposit.

Job-proved on all automatic-welding processes, P&H Constant Voltage Welders are used for submerged arc, inert gas, semi-automatic hard surfacing, automatic stud or low current density welding.

Enjoy high efficiency (85% or better) with P&H Constant Voltage Welders. 500, 750 and 1200-amp capacities. Send in the coupon for more information.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTH – ARC SCOTTY... with some important facts on P&H Constant Voltage Welders that will save you money. Just drop me a line.

P&H Constant Voltage Welders give you more efficiency plus big dollar savings in all automatic-welding processes.

P&H HARNISCHFEGER CORPORATION
Welding Division
4514 West National Avenue, Milwaukee 46, Wisconsin
Attention: Mr. W. R. Stephens, Sales Manager

I'd like more information on P&H Constant Voltage Welders.

Name _____ Title _____

Company _____

Address _____

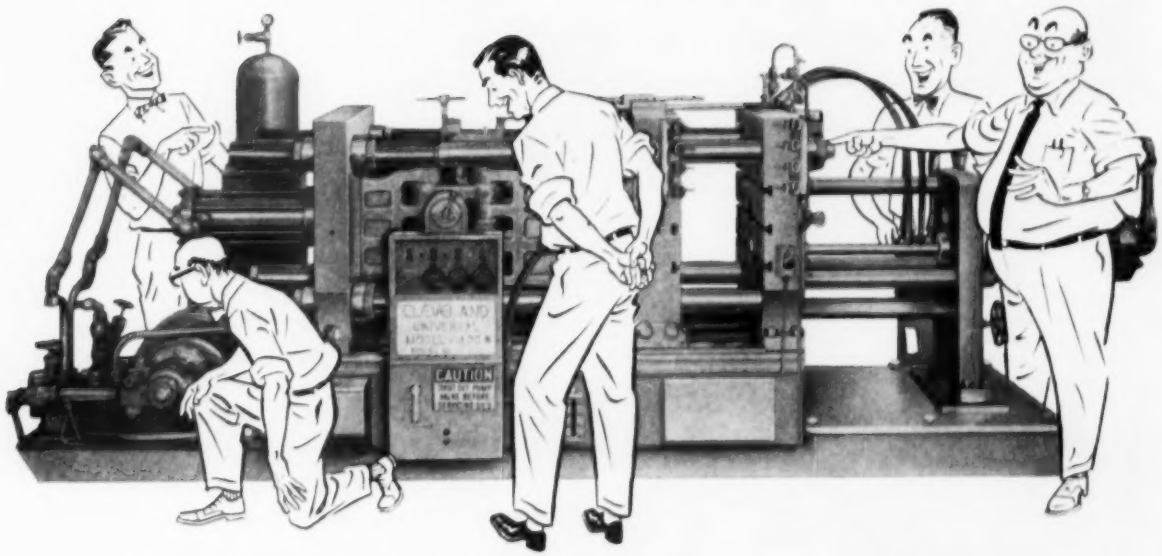
City _____ Zone ____ State _____

SEND FOR FREE INFORMATION TODAY!

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

WELL WORTH LOOKING INTO!

Cleveland Model 400-N shown with cold chamber end. Weight of metal per shot, including gate: 7.2 lbs., aluminum; 14.5 lbs., zinc.



New CLEVELAND model 400-N

Hydraulic Universal Die Casting Machine

Write for new Bulletin

From every angle, the new Cleveland Model 400-N has every feature you're looking for to give you better castings, faster, at less cost!

Here is a massively constructed, rugged, powerful machine. It locks dies at better than 400 tons pressure, *strain gauge tested*. Its faster die closing and opening speed will give you more shots per hour. Its rapid injection speed guarantees production of sound, dense, hardware-finish castings. Further, Cleveland's time-tested design and quality construction assure dependable, around-the-clock operation with machine maintenance at a minimum level.

Look into the new Cleveland Model 400-N, from every angle. You'll quickly discover why leading die casters call it the outstanding machine buy in its capacity range. Call in a Cleveland sales engineer for complete information and send for the new Model 400-N Bulletin.

REMEMBER, CLEVELANDS CUT COSTS

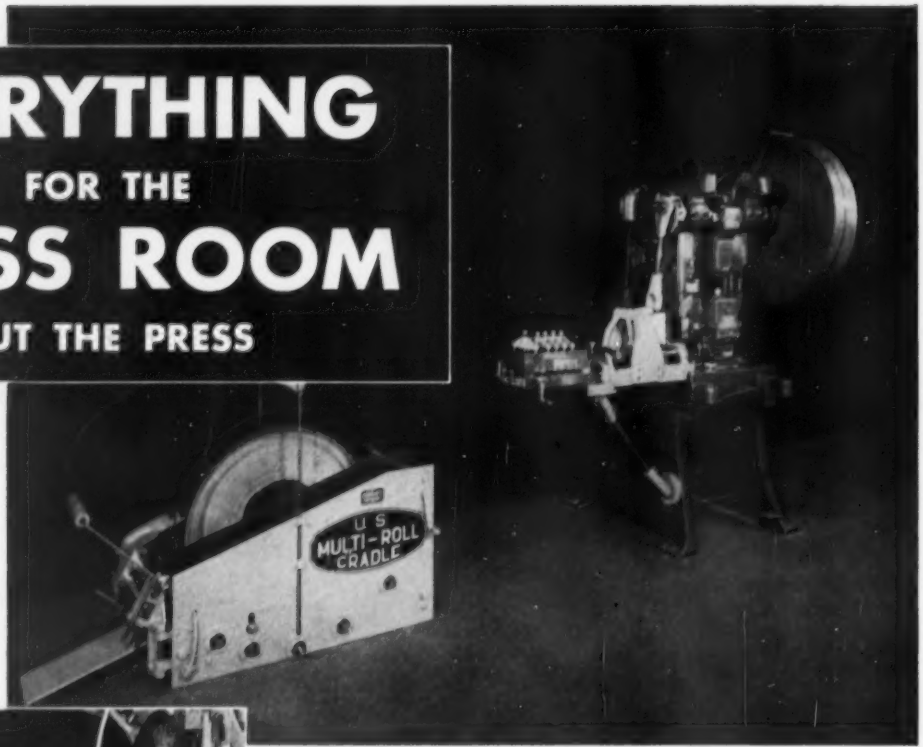
THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

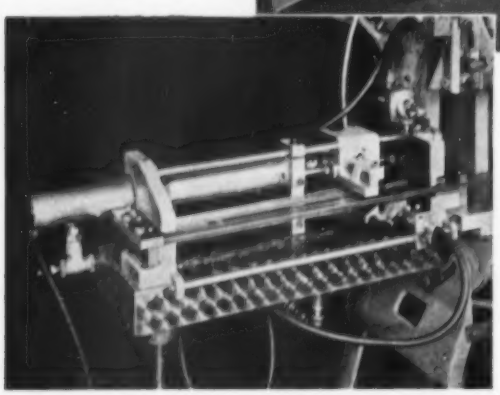
SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

EVERYTHING
FOR THE
PRESS ROOM
BUT THE PRESS



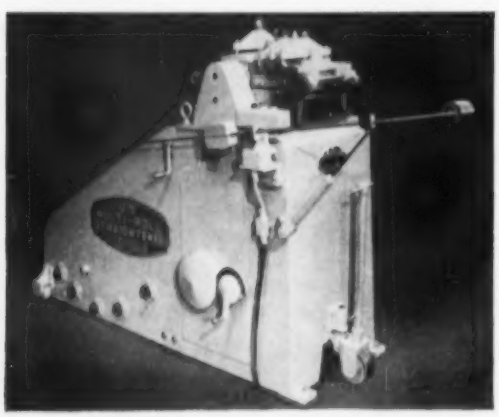
Right: Conventional OBI Punch Press equipped with U.S. Slide Feed with Plain Straightener and U.S. Multi-Roll Cradle.



Above: U.S. Air Operated Slide Feed (no mechanical connections to the press), open side type, suitable for material up to 15" in width and feeding length adjustable up to a maximum of 12" at one stroke. Longer feed lengths obtainable by cycle feeding with counter.

Reduction of costs is a primary concern of all manufacturers. Units included in the line of U.S. Automatic Press Room Equipment such as U.S. Slide Feeds, Roll Feeds, Stock Reels, Coil Cradles, Stock Oilers and Wipers, Scrap Choppers, are designed and built with the aim of converting the punch press into an automatic machine. The end results are increased production, reduced scrap, reduced operator fatigue, reduced material handling and overall reduced costs.

If you use presses in your production processes, ask for copies of Bulletins 80-A and 95-A.

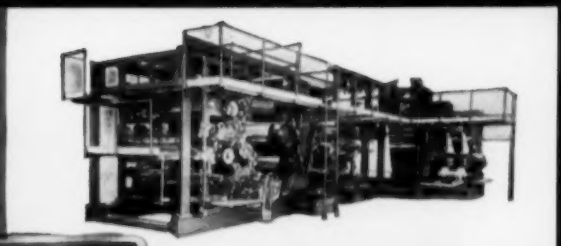


Left: Model PDSC-940 U.S. Combination Coil Cradle and Power Driven Straightener suitable for material up to 9" in width and coils with O.D. up to 40", weight capacity 1,500 lbs.

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories



a long reach...

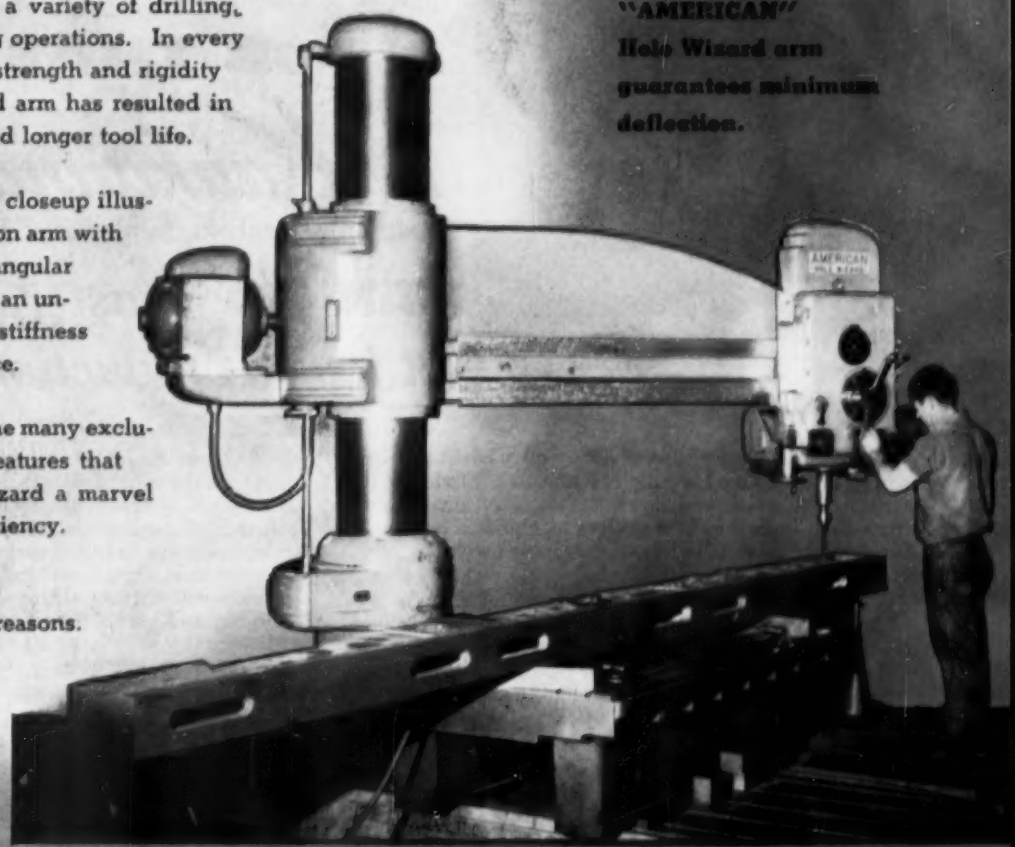
The Cottrell Company, world famed for multi-color printing press manufacture, relies on a 7′ arm, 17″ column "AMERICAN" Hole Wizard Radial for a variety of drilling, tapping and boring operations. In every instance the extra strength and rigidity of the Hole Wizard arm has resulted in greater accuracy and longer tool life.

The accompanying closeup illustrates the box section arm with its full length triangular ribbing, providing an unmatched degree of stiffness and stress resistance.

This is but one of the many exclusive "American" features that make the Hole Wizard a marvel of productive efficiency.

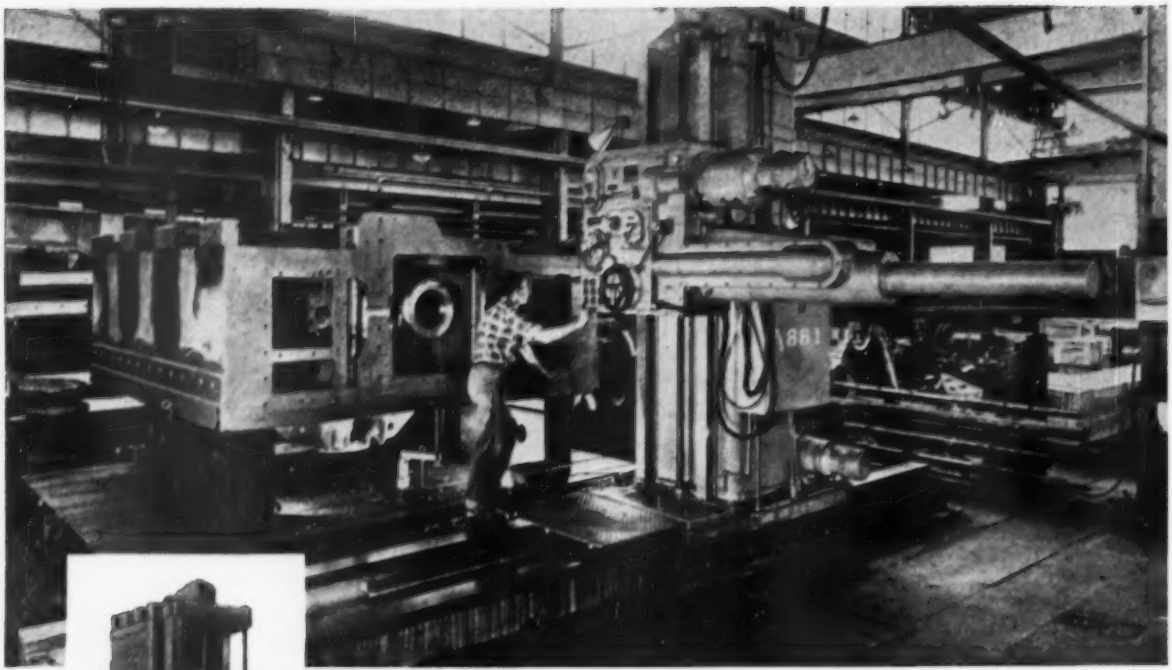
Bulletin No. 327
tells you all the reasons.

It's a long reach but the superstiffness of the "AMERICAN" Hole Wizard arm guarantees minimum deflection.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



A JOB THAT ONLY A *Kaukauna*

HORIZONTAL DRILLING, TAPPING AND BORING MACHINE

CAN DO—*faster, easier, at lower production cost*

A leading manufacturer of heavy duty earth moving equipment installed a single Kaukauna Model 3040 Drilling Machine and secured far more production work than from the three drilling machines it replaced. Since the original installation, four more machines have been purchased for other plants.

Time and labor savings are tremendous. A majority of the operations are drilling and tapping the roller frames and main frames of large cranes, and boring large holes for the boom pin and bearings in the frame itself. Many of these bores are 6 inches and 7 inches in diameter and require the use of extension bars to line bore the necessary holes.

The extreme rigidity and power of the Model 3040 enable these operations to be performed more quickly than with the usual drilling machines and greatly reduce the amount of crane time and setup time formerly required. Stub-boring operations are also performed easily and quickly due to the accuracy and ease of positioning; floor space is greatly reduced because the Kaukauna has sufficient horizontal travel to cover the entire part; handling and setup time have been cut radically. In addition, the variety of speeds and feeds enables the operator to change quickly from large to small drilling operations with the least amount of idle time.

Learn now what a Kaukauna will do for you by time estimates on your various jobs. Consult your nearest Kaukauna distributor, or phone, wire or write direct.

KAUKAUNA MACHINE & FOUNDRY DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

KAUKAUNA, WISCONSIN, U.S.A. TELEPHONE ROckwell 6-4631 CABLE KAUMACH

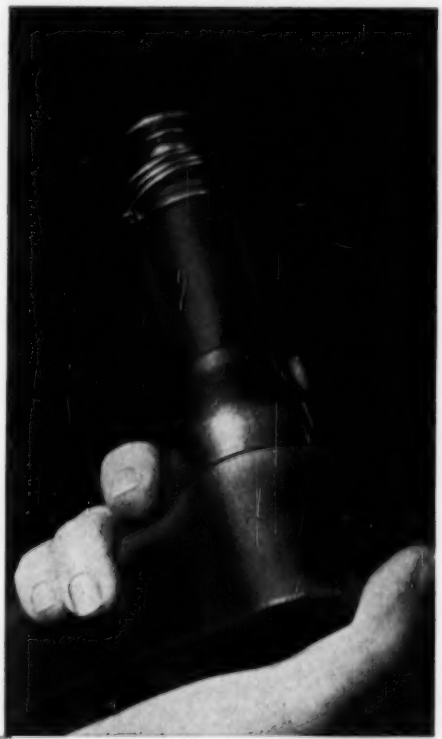
Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

Airplane Builder's Change to Bearcat Increases Life of Rivet Sets 5 Times



At the Wichita, Kans., plant of Boeing Airplane Company, rivet sets used on the B-47 and B-52, as well as other types of aircraft, had been providing satisfactory results. But, Boeing engineers reasoned, by checking the performance of other grades of tool steel in the same application, they might discover a tool steel that could do a better, more economical job.

So they ordered Bearcat, from Ford Steel Company, their Bethlehem tool-steel distributor in St. Louis. The results were impressive. The Bearcat sets gave five times longer service life then the sets previously used. In addition, the heads also drove down better, thus minimizing time lost in reworking, and facilitating ready acceptance by Boeing inspectors. Besides, with Bearcat's superior finish, there was less surface pick-up.

Bearcat is our super-tough, air-hardening general-purpose grade. It has exceptional resistance both to shock and to wear. Its air-hardening characteristic minimizes quenching hazards, and provides excellent resistance to distortion in heat-treatment.

In addition to rivet-set applications, Bearcat can be used advantageously for punches, chisels, hot headers, gripper dies and master hobs, as well as for dies used in blanking and bending, and cold-forming.

If you'd like to know more about Bearcat, or perhaps try it out in your shop, just get in touch with the nearest Bethlehem tool-steel distributor.

BETHLEHEM TOOL STEEL ENGINEER ASKS:

How Hard Should Tools Be?

It is sometimes difficult to determine the best hardness for certain tools. As all tools are subjected to wear it is ordinarily desirable to use the highest possible hardness. With most tools, this causes brittleness or breakage, making some compromise necessary. Generally speaking, tool hardness should be lowered from the maximum to a degree which causes the tools to consistently wear out in service, rather than fracture. The optimum hardness for a given type of tool often varies considerably, depending upon the operating conditions. However, here are the average hardnesses of commonly used tools:

TOOL	HARDNESS ROCKWELL C
High-speed steel, metal-cutting tools, single point	65
High-speed steel, metal-cutting tools, multiple point	63
Blanking dies	60
Forming dies	60
Drawing dies, hardened all over	60
Drawing dies, bore-hardened only	66
Gages	60
Shock-resisting tools (punches, etc.)	58
Hot-work tools	40/50
Cold shear blades	60
Hot shear blades	48
Tools subjected to max tensile loads (cylinders, containers, etc.)	53
Tools subjected to max compressive loads (plungers, punches, etc.)	60/65

These hardness figures should be used as a guide only, because for individual jobs the required hardness may be slightly higher or lower, depending upon circumstances.

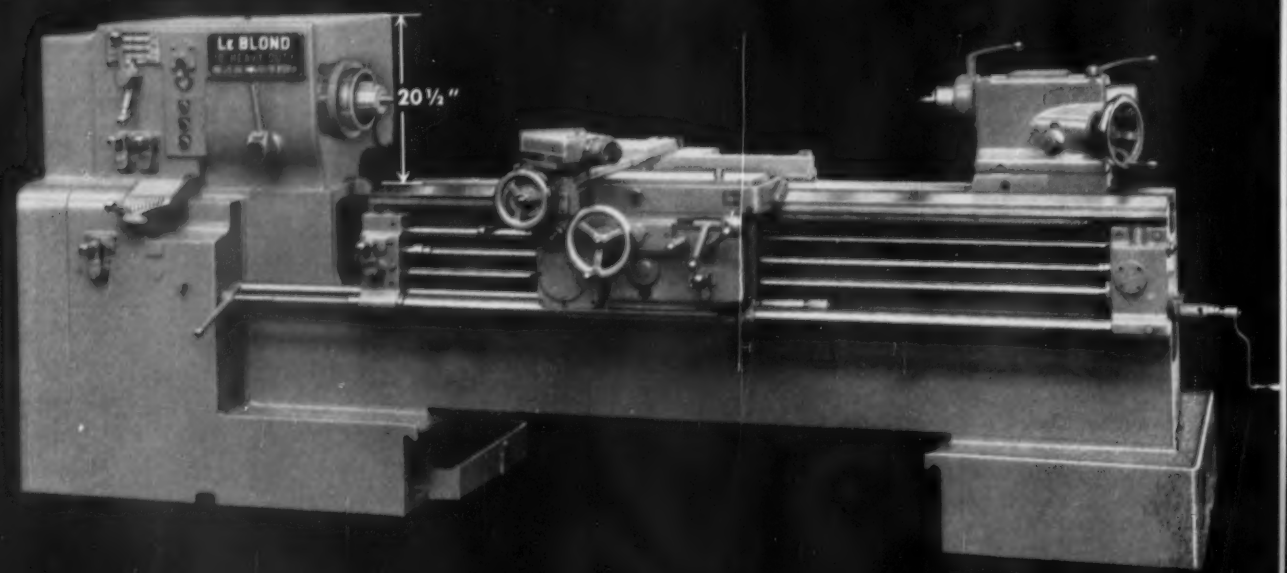
Tool Steel Color Film An Award Winner

"Teamwork," Bethlehem's 16-mm color film on tool steel, received an award for excellence in the sales promotion field at the recent Columbus Film Festival, held at Columbus, Ohio. The film, being received enthusiastically in all parts of the country, shows the manufacture of Bethlehem tool steels, and explains the reasons behind their quality control and heat-treatment. Typical applications of various grades are included.

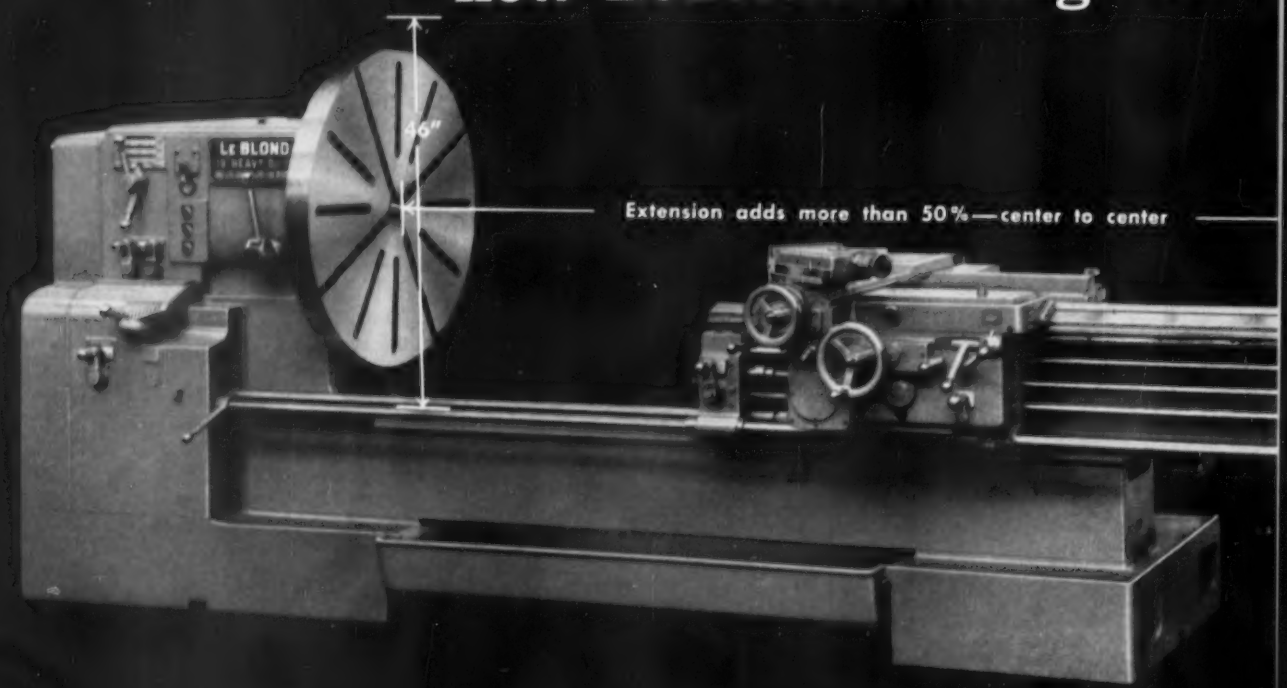
The picture runs for 30 minutes. It is available for showings to machinists, die-makers, heat-treaters, machine-tool manufacturers and distributors. Its subject matter makes it excellent for technical society meetings, and for showings to engineering-student groups.

If you would like to see "Teamwork," drop a line to Publications Department, Room 1001, Bethlehem Steel Company, Bethlehem, Pa. If possible, please select a showing date well in advance, to permit adequate time for scheduling and shipping.

the lathe that gives versatile a new

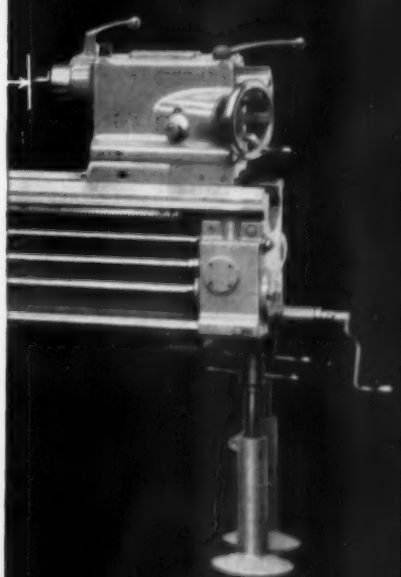


new LeBlond sliding bed



meaning!

gap lathe



Here's a lathe that is fundamentally different. It has a special bed that *slides* open to form a gap—gives you approximately *twice* the normal swing size. Sliding the bed also gives greater bed length, more than 50% greater distance between centers. And, with bed closed it functions as a regular engine lathe.

So, what we mean by a *versatile* lathe is one that actually changes shape to suit your odd-shaped parts. It handles all the usual work, plus a wide variety of large diameter jobs, extra long parts, and combinations of the two. "Swing size" as such is no longer a limitation. For example, here are some of the unusual capacities you can handle on the 16" LeBlond Sliding Bed Gap Lathe:

Face 38" diameters in one cut
Face 45" diameters in two cuts
Turn lengths more than 50% greater than normal center distance
With extension rest (optional): turn 27½" diameter, 13¼" length
With Full-Swing turning attachment (optional):
turn 45" diameter almost full length of gap

Other important features of the new LeBlond 16"/38" SBG Lathe include new spindle bearing design for high-speed turning, combination gear-belt drive headstock, 18 geared speeds, 9 timing belt-driven speeds from 8 to 2000 rpm, spur gear design, four-way rapid traverse, one-piece apron, totally enclosed quick change box, hardened and ground steel bedways, thrust-lock tailstock.

If you have a variety of parts to turn—particularly the unpredictable extremes you encounter in maintenance and job shop work—the LeBlond SBG may well be the answer. An economical answer, too! SBG's come in 4 sizes: 16"/38", 25"/50", 32"/60" Heavy Duties and the 17"/28" Regal. Like all LeBlonds they are built in every engineering detail to give you long dependable service.

Whatever your turning needs, there's a lathe in LeBlond's complete line to do the job. 76 different models to choose from. Call your LeBlond Distributor or write today.

. . . cut with confidence

LEBLOND
of Cincinnati

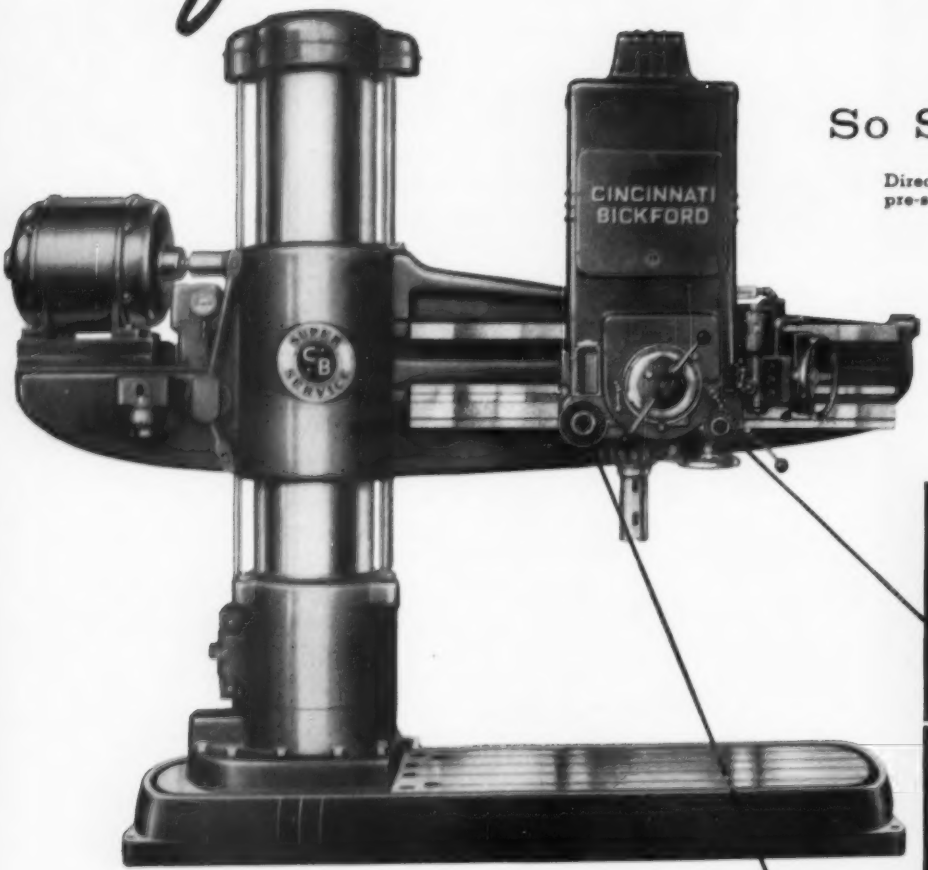
THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

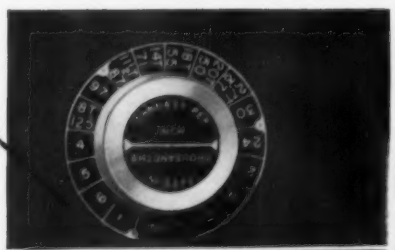
World's largest builder of a complete line of lathes for more than 69 years

So *quick*... So EASY...

So SIMPLE...

Direct and quiet shifting into pre-selected speeds and feeds.





HYDRAULICALLY PRE-SELECTS all 18 feeds

Positive geared tap leads and feeds are quickly pre-set.

HYDRAULICALLY PRE-SELECTS all 36 speeds

Speeds and tool diameters shown in large easy to read figures.

Super-Service Radials are available with complete hydraulic pre-selection of all 36 speeds and 18 feeds. Two convenient direct reading dials control the automatic shifting of sliding gears. While the tool is cutting, merely set the dials to the speed and feed for the next operation. As the spindle is stopping for inserting the next tool, the shifting is done hydraulically . . . directly, quietly and quickly. No other operations—no loss of time. Write for catalogs.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

Caught in the middle?

If grinding problems have you caught in the middle and you don't know which way to turn, switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

Here's why you'll stop leading a dog's life when CINCINNATI (PD) WHEELS are on the job: Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.* So, we think you'll agree it's worth taking a close look at CINCINNATI (PD) WHEELS right away.

Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

(PD) POSITIVE DUPLICATION

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U. S. Pat. Off.

CINCINNATI° *Grinding Wheels*

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the new additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the new "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

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"THE TOOL HOLDER PEOPLE"

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If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.

Write for your free copy of this important booklet today!

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CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

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you get in
BALANCE

duMont
TOOL BITS
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An almost perfect balance of *toughness*, *red hardness* and *wear resistance* enables duMont Tool Bits to hold a keener cutting edge longer, gives you a bonus of cutting life in every bit.

Fill in the coupon below to get full information. Then make your own performance tests. You'll see what a difference balance can make.

The duMONT CORPORATION
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Backlash

SEND LETTERS TO:
BACKLASH EDITOR American Machinist
330 W 42nd ST, N Y 36, N Y

Proof of the Pudding

As you said in an editorial a little while ago, "The Russians are No Dopes." (*AM*—Feb 13 '56, p119). Your article in the current issue (*AM*—May 7 '56, p134) certainly seems to prove this. It puts out some original ideas that ought to be worth trying. Of course, there is no way of knowing if these ideas will really work, or if they were just put out to fool us ignorant Westerners and create a favorable impression. The stuff does, however, look genuine, and if I find it works I shall have occasion to be really grateful to you for publishing it, as it concerns a problem that is currently giving me a great deal of trouble.

R A Quinn
Chicago

Waste Not, Want Not

Your article on throwaway tools (*AM*—May 7 '56, p 154) proves again that we Americans are the most wasteful nation on earth. Long ago, my Mother, who was of French origin, told me that a French family could live in comfort on what an equivalent American family threw away. And what holds for family life would appear to hold also for industry.

The whole idea of the "throw-away economy" is basically unsound. Undoubtedly it means greater sales and greater profits for the producers of the thrown-away product, but any kind of waste of material is fundamentally bad business.

The idea of a *replaceable* carbide tip makes sense. Certainly we cannot afford to stop production while a dull tip is being reground. But that does not mean that the bit should be discarded. All that is needed is someone with enough knowhow to regrind it on a batch basis, as you mention is being done by one company.

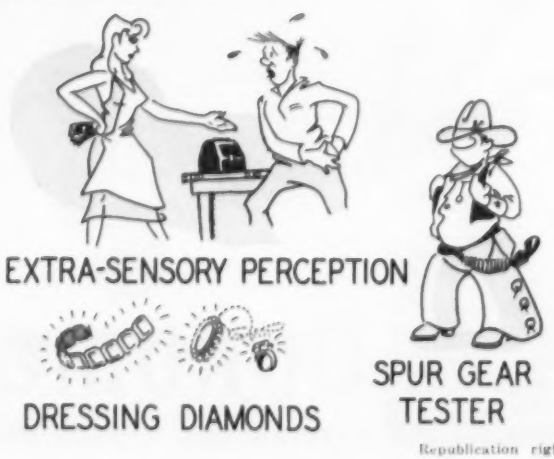
We seem to have developed in this country a Philosophy of Waste that is entirely without justification. For years we have snorted with indignation when our wife demands a new dress because she has "worn this one twice and all my friends have seen it." Manlike, we surrender, and a perfectly good and beautiful dress, worn only twice, is thrown away. It is not even given to a maid to get some further use out of it, because it might be seen and recognized. It must be destroyed—wasted.

Yet in spite of our indignation, we are cheerfully doing exactly the same thing with valuable cutting materials because we are too lazy to figure out some way of salvaging them.

And now about this business of

GRINETICS

By D G SMITH



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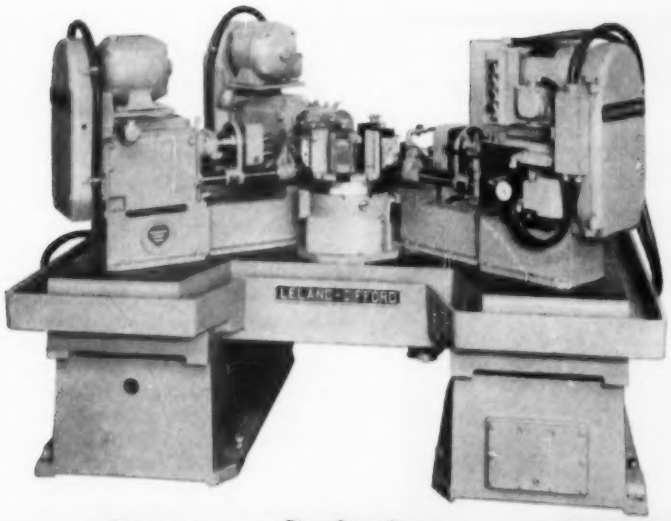
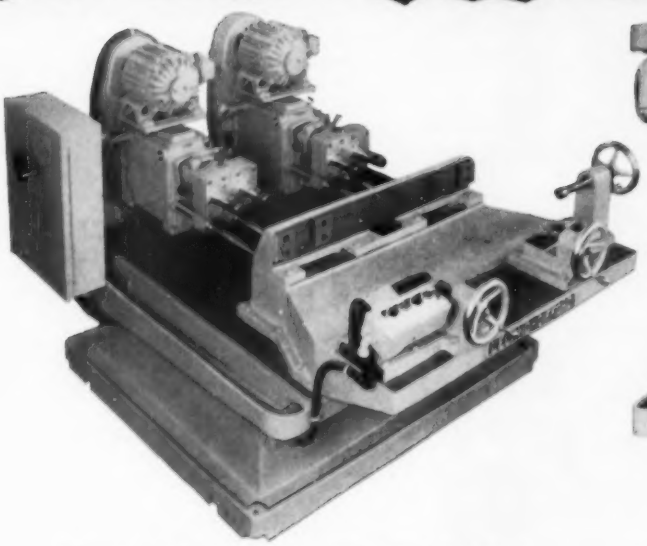


Mechanize Hand Operations

THE JOB — Drill and ream four holes on the face and two ends of automatic transmission valve body.

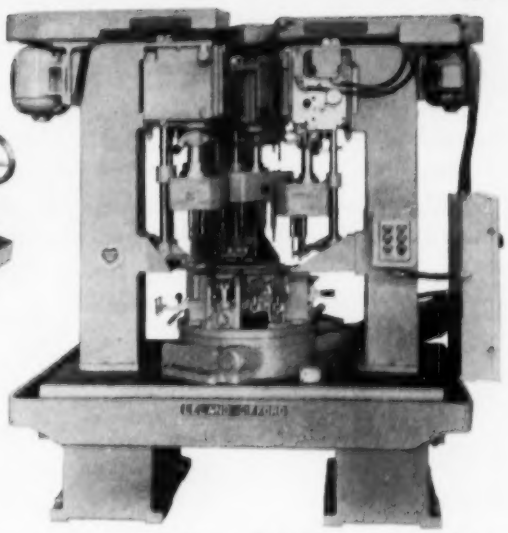
THE SETUP — Three No. 2 self-contained deep hole units with 2-spindle multiple heads and a 5-station hydraulic indexing station. Production: up to 120 pieces per hour.

LELAND-GIFFORD *Special Drilling Machines*



THE JOB — Drill and ream two .750/.751 dowel holes in 4 and 6-cylinder engine blocks.

THE SETUP — Two No. 3 self-contained units with 2-spindle heads mounted on a special base with work holding and positioning fixture.



THE JOB — Drill and ream 9 holes in one face and 2 deep angular holes in one side and one end of a control valve housing.

THE SETUP — One No. 3 and two No. 2 self-contained units with multiple heads vertically mounted over a 2-station automatic indexing table.

Contact the office nearest you for help with your drilling problems.

LELAND-GIFFORD
Drilling Machines
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NEW YORK OFFICE
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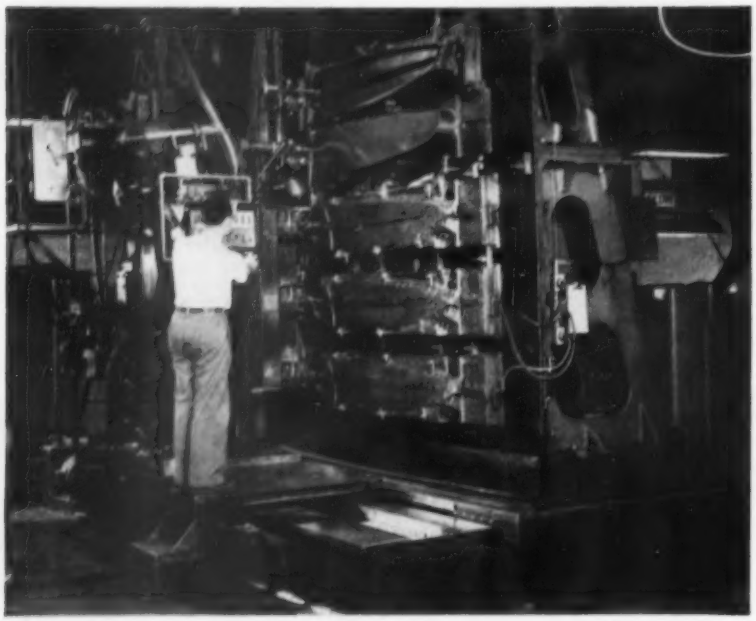
South Orange, N. J.
LOS ANGELES OFFICE
2620 Leonis Blvd.
Vernon 58, Cal.
INDIANAPOLIS 6, P. O. Box 1051
ROCHESTER 13, P. O. Box 24, Charlotte Station

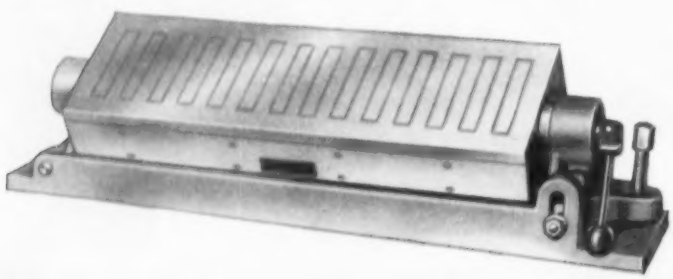
Walker Does it Again-



Three WALKER electro-magnetic chucks mounted on milling machine, making possible profile milling three propeller blades in one operation.

WALKER engineers and makes chucks for unusual applications as well as standard holding devices for irons and steels, non-ferrous metals and non-metallic materials.

Whatever your holding problem the originators of the magnetic chuck will solve it for you.



AND—A Walker Permanent Magnetic Swivel Chuck—a type heretofore limited to Electro Magnetic Chucks. Another one of many applications by Walker.

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

IN CANADA—UPTON BRADEEN & JAMES, LTD.

discarding units that require only minor repairs. Your water-pressure regulator is a case in point. In place a 35¢ diaphragm, plus labor—say a total of $5.00—you had to pay $35 for a complete new unit. Why could not the plumber have installed a factory-rebuilt unit for five or six dollars, and have returned your old one to the factory for rebuilding? Ford did this with engines, making it cheaper to install a completely rebuilt engine than to overhaul the old one, because with factory methods and equipment it could be done cheaper than in a local garage. If Ford could do it and make it pay, why cannot the same thing be done with other products? No wonder we are constantly faced with shortages of copper, aluminum, steel, and other materials.

No one would countenance eating one slice from a loaf of bread and throwing the rest away—then breaking open a new loaf when we wanted a second slice—even though it might help to dispose of our huge grain surplus. Why then should we encourage similar waste of other materials of which we have no surplus? The specious arguments that it is cheaper in the long run will not hold water when examined more closely. If we have carbide to throw away, I am sure the Russians would be glad to take all of it. They would probably pay for packing and shipping, too.

R C Timmons
Cleveland

No, Mr McClellan!

I have just read with great interest Robert McClellan's letter (*AM*—Mar 26 '56, p74). I was especially interested in reading his letter since I am an industrial supervisor who has given considerable thought to the problem.

In view of the manner in which Mr McClellan chooses to correlate facts (concerning the plight of the white-collared worker) with his own experiences, I am impelled to answer his candid letter. He puts the spotlight on a problem needing constant attention and I believe he does it wonderfully well. I am not presenting this rebuttal for the sake of argument, but only because of possible implications projected in the letter. Perhaps his personal experiences give him a far more intimate knowledge of the problem than this writer would ever possess. Even though a quarter century of association with white-collared workers gives me at least a hypothetical reason for daring to interpret their point of view, this letter is a presen-

tation of my own viewpoints and should not be interpreted as the thinking of one particular group.

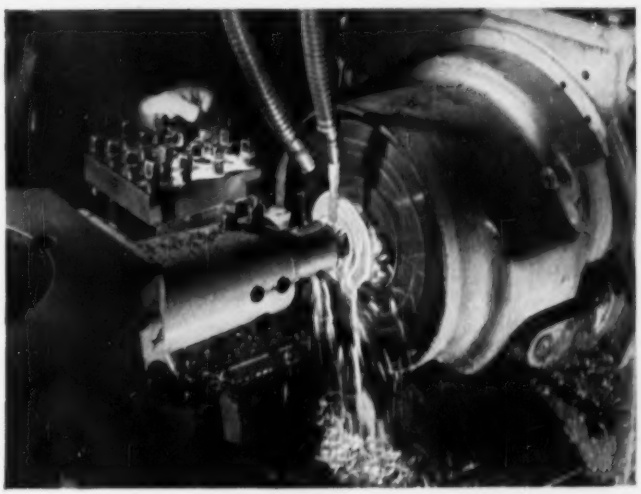
I believe there are no glib answers to Mr McClellan's letter, for it deals with an intricate economic problem. In view of recent events and the serious implications for all segments of our industrial democracy, it is in business' self-interest to sit down in common counsel and seek a solution to the white-collared workers' problem. I suggest that this can be done by shifting some weight from one side to the other, by shifting the emphasis from organized labor to unorganized labor. It is not difficult to understand Mr McClellan's theories about the problem. It is simply a matter of understanding what motivates his thinking.

We are living in an age of growing collectivism. And I bring this concept into focus because it may have some bearing on Mr McClellan's experiences. I, for one, believe that the scope of the unorganized worker's job in modern industry will be limited or increased by the scope of a man's thinking. Each company has its problems, I will admit. But I'm also quick to say that there's nothing wrong in a progressive plant that its company officials don't know about and aren't trying to fix. Non-union workers have their wants and needs, and it is management's duty to itself to face these needs with mature judgment and conscientious deliberation, if only to preserve the present status. If this is not done, human nature being what it is, the day may soon come when the unorganized worker in American industry will lose psychological touch with his own integrity and seek the very protection of the labor unions he now ethically seeks to avoid.

It is my belief that the economic role which unionization is playing is highly questionable. There are cases where union pressure has raised wage scales, introduced fringe benefits and improved working conditions for a particular group at a particular time. But to say that unionization has raised the general level of real wages is just not true. The historical evidence indicates rather that productivity, not unionization or non-unionization, has been the real factor in determining the level of wages. We further believe that executive management is deeply concerned with the values which become the basis for determining salaries of white-collared workers.

Lou Rosenthal, Foreman
The Electric Products Co, Cleveland

Improved Lusol..
A BETTER PRODUCTION METHOD



Improved Lusol, an oil-free transparent water-soluble metalworking solution, has the highest heat removing capacity of all coolants, regardless of type. It keeps tools cooler so cutting edges last longer. It keeps work pieces cooler so closer tolerances can be maintained. In addition, the Lusol method keeps machines clean, eliminates odors, smoke and oily floors, and eliminates the basic causes of dermatitis. It all adds up to better production under better working conditions. That is worth investigating.

CONCENTRATION TEST KIT

With this pocket size Concentration Test Kit Lusol users can check the concentration of the solution right at the machine. Only takes a minute or two.

Lusol.. LABS
BETTER PRODUCTS FOR BETTER METALWORKING

F. E. ANDERSON OIL COMPANY INC.
BOX 215, PORTLAND, CONNECTICUT

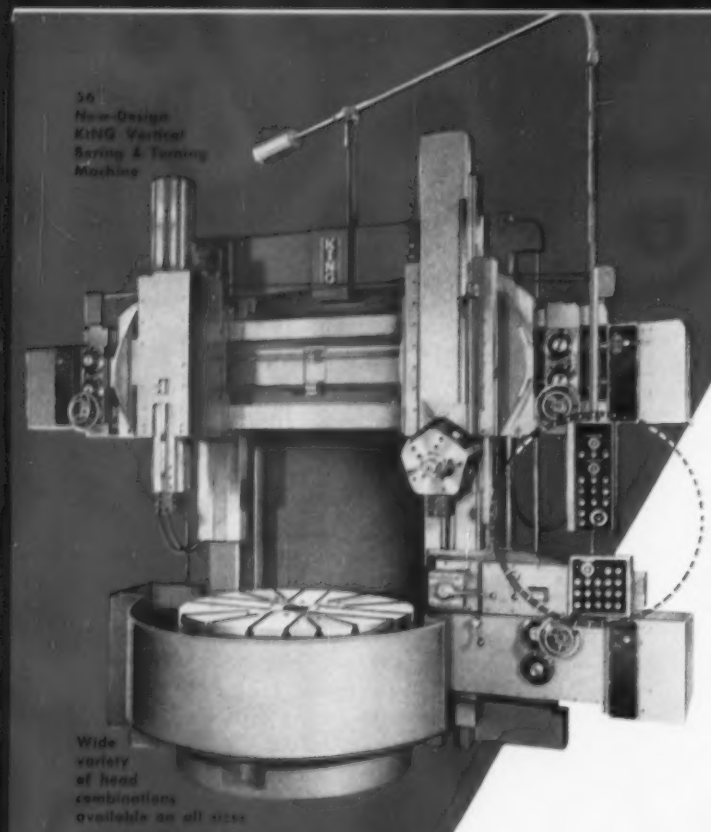
Goodbye
"Old Faithful,"
we hate
to see
you go...

By rights, "Old Faithful", our 21" stationary head floor drill, should have been the first machine in our complete line to be redesigned. It looked old fashioned—even when new. But the funny thing is, we kept getting orders for it. Why? For the simple reason that it served a great need for general purpose and maintenance drilling. It was dependable. And it could drill holes like a demon, up to 1¼" in cast iron.

In "Old Faithful's" place has come a brand spanking new Cincinnati 21" stationary head floor drill. It has all the ruggedness and dependability of its predecessor. That it's safer is easy to see, what with complete belt and gear guarding. But other changes have been made, too. Spindle travel has been increased a full three inches—to get at those deep jobs. Number of spindle feeds has been increased. The column diameter is bigger. Back gear change is accomplished now by a simple push-pull selector. Electrical controls are built in. *And every drill is shipped complete with motor and controls.* All you do is uncrate it—hook it up—start drilling.

We'll admit to a nostalgic twinge when we think of "Old Faithful". But the orders we're already getting for its successor eases our sorrow. Write today for catalog data and the name of your CL&T Dealer. Cincinnati Lathe and Tool Company, 3246 Disney Avenue, Cincinnati 9, Ohio.

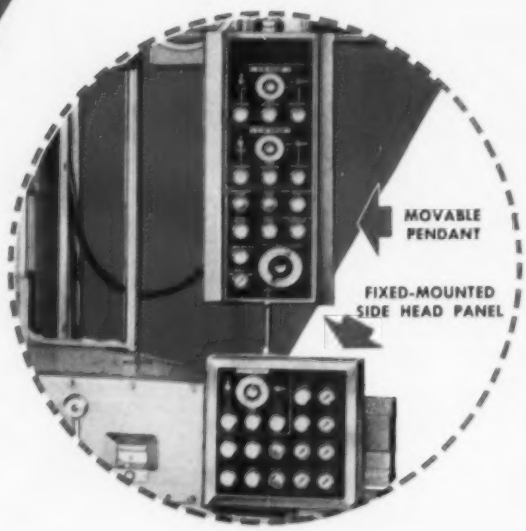
CINCINNATI
LATHES
AND
DRILLS



56" New-Design KING Vertical Boring & Turning Machine

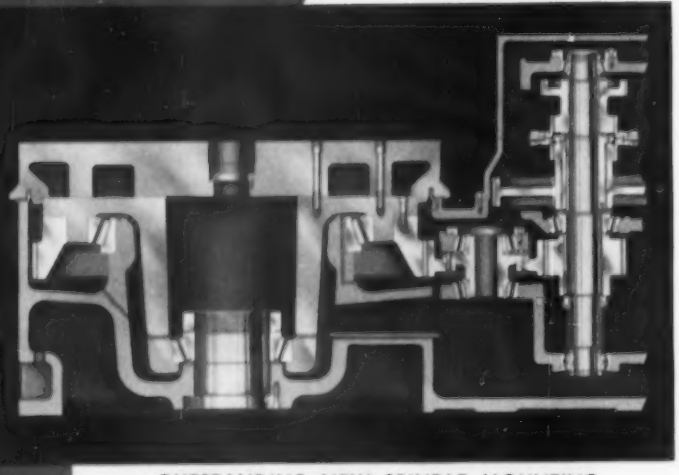
Wide variety of head combinations available on all sizes

New-Design KING



Full Electrically Operated

. . . gives you faster production at lower costs!



OUTSTANDING NEW SPINDLE MOUNTING

As shown in drawing, the spindle itself is extra heavy and rigid. Tapered roller, pre-loaded bearings are located so as to provide maximum spread, both radially and vertically, on the spindle. This construction greatly increases stability of the mounting. Note also that the drive is of helical-gear type, eliminating any tendency toward spindle deflection and loss of accuracy—a tendency always present with bevel gearing.

Full electrical operation has been engineered into these streamlined New-Design KING® Vertical Boring & Turning Machines. Control manipulation is cut to a bare minimum, speeding set-up time. Direction of all head movements is established by simplified "up-down" and "in-out" switches. Spindle speeds and feeds for all heads are pre-selective from direct-reading dials, conveniently located on the movable pendant and fixed side head panel, as are all other electrically operated controls.

Increased horsepower plus expanded speeds and feeds will remove metal at rates that take fullest advantage of the most modern cutting tools. Improved spindle operation, with resultant increased accuracy, is assured by many advanced construction features as illustrated in drawing at left. Integral drive construction permits removal of the entire drive as a unit, for easy maintenance.

These and other superior advantages in the new KING machines will greatly increase both accuracy and productivity on your boring, facing, and turning work. For full details see your King Distributor, or write us direct.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

Spot news...

- **Titanium plating on less-valuable metals is being investigated.** Object: corrosion resistant finishes.

- **Science is "on the doorstep" of cracking the thermal barrier in lubrication,** according to GE chemist D F Wilcox, who says biggest bottleneck in making faster planes is in finding fluid lubricants that will function up to 2000 F. Most promising compounds to date: silanes — synthetic silicon-based lubricants.

They're calling it "middle-ground automation" (manual transfer of work on roller conveyors between automatic, multi-purpose machines) at International Harvester's Indianapolis plant, where it's the solution to turning out V-8 and inline 6-cyl truck engines at prices competitive to similar engines turned out by the highly mechanized automakers. (Details on p176).

- **Using a mobile work center, 20 men can set up a 1000-position plant in 24 hrs.** Alden Research Center recently demonstrated the center (transfer elements, controls and power package that can be warehoused for instant use) by setting up a complete four-position manufacturing operation in 29 minutes.

- **Food and beverage cans with 98% less tin than present types** will soon be produced by American Can Co, using margin plating, a new process that requires only a thin strip of tin plate along edges for soldering into airtight seams.

Russians want to buy $100-125 million of machine tools, many of them on the embargo list, from the British in 1956-1960. Some $75-100 million is for transfer machines. They also would like: 500 "special multiple-head" machines, 100 universal pattern millers, 50 gear cutting and shaving machines, 70 straight-side mechanical forging presses.

- **How will auto sales wind up this year?** This is what the experts think: AMC President George Romney — 5.892-million units; GM's Harlow Curtice — 5.8 million; Ford Economist George P Hitchings — 5.9 million. All agree the second half will taper off from first half to pave way for '57 models.

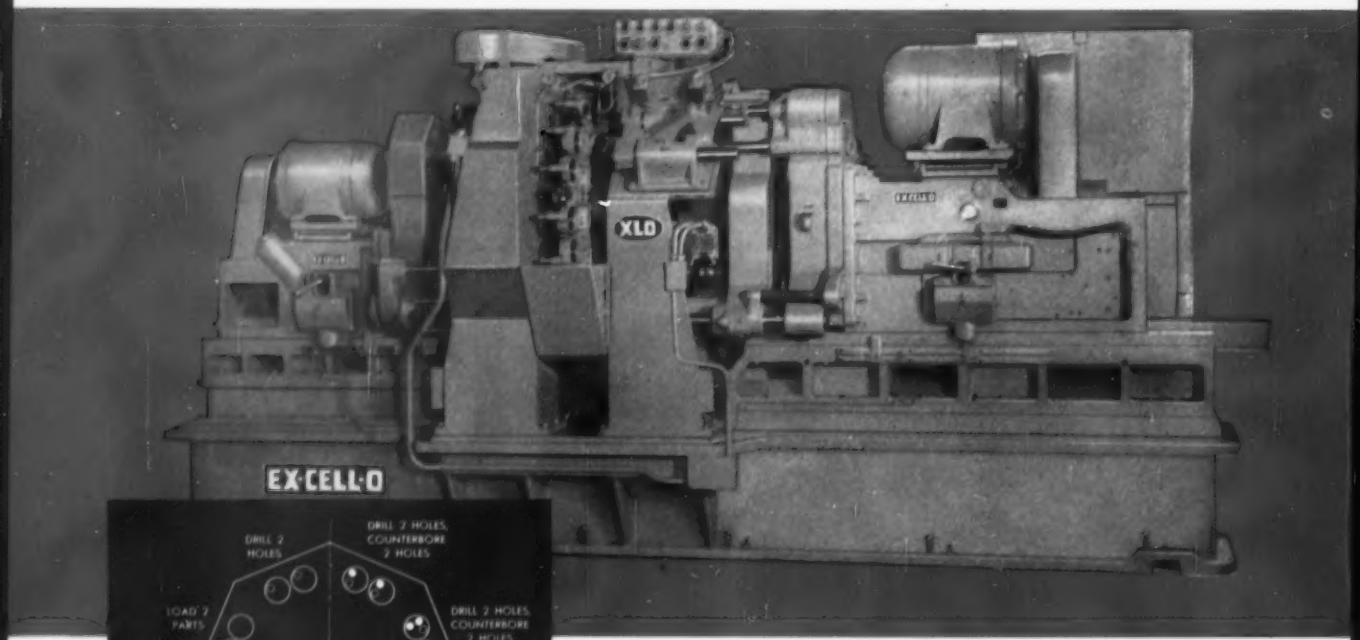
- **Guided missile output is booming on the West Coast,** so much so that Lockheed officials at groundbreaking ceremonies for its Missile Systems Division plant at Sunnyvale, Calif, announced (1) that the plant will be three times its original planned size, and (2) that Lockheed's Van Nuys, Calif, plant, which Sunnyvale was to replace, will remain in operation.

- **Now that Detroit's a labor distress** area, it's qualified for limited federal aid: (1) matching lowest bid for defense contracts, (2) fast tax writeoffs for new defense plants, and (3) a 6% preference over foreign bidders on government contracts. Maybe these advantages will mean something to the big automotive firms—so far they've been ineffective in other distress areas.

- **Life of plastic metalforming dies can be lengthened** by casting them with a coating of high wear-resistant steel sprayed onto the plaster die mold over a release agent. British sources report dies cast with 0.020-0.030 in. thick Ni-Cr-Mo facing have produced 27,000 pressings in 18-gage steel sheet without showing any signs of wear.

SPECIAL EX-CELL-O MACHINE

Drills and Counterbores 514 Rocket Nozzles per Hour



This diagram shows the progressive operations. At station 7, parts are automatically ejected.

Front and rear view of completed part. The rocket nozzle is tough forged steel; location of holes to each other and to the four pronged slots is critical.

Here's another Ex-Cell-O solution to a hard-to-handle machining job. Rocket nozzles are small, tough steel forgings. For the drilling and counterboring operations—shown in diagram—critical dimensions must be held.

Ex-Cell-O designed and built this special machine with a trunnion fixture that indexes through eight stations. Two Standard Ex-Cell-O Slide Type Hydraulic Power Units—one for drilling, the other for counterboring—actuate the multiple spindle heads. Features of the machine include simplified design, high productivity, safety and sturdiness. . . . When you're faced with a tough machining problem, call in Ex-Cell-O.

XLO
EX-CELL-O for PRECISION

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
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AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-28

Washington ... NEWS REPORT

New inter-service ruckus...

Another round of Army-Navy-Air Force squabbling has flared up. At issue is the problem of individual service roles and missions and the control of guided missiles and other new weapons—all of which boils down to the question of how the defense budget gets split up among the three competing services.

The ruckus became so serious that Defense Secretary Wilson was forced to call an extraordinary press conference, with the Joint Chiefs of Staff and the three civilian service Secretaries, to put on a show of Pentagon unity. In addition, at least two Congressional committees are readying plans to step into the controversy. The latest round of inter-service wrangling comes up against the background of another Defense Dept "New Look" at the size and nature of U S military forces (see p173). Presumably, this is being made under the present framework of the individual services' roles and missions; there's no hint yet of any significant change in service assignments.

More boom or a slide?

Top economic experts in Washington are sharply split over whether the business outlook—short-term—is for a business slide or a new jolt of inflation.

The Federal Reserve has boosted the price of borrowed money on the theory that the boom is producing the makings of a round of inflation—and that by making it more expensive, businessmen will borrow less money to carry out their business plans. This, the bankers feel, is what's needed.

Top administration officials—Secretary Humphrey, Secretary Weeks, Economic Adviser Burns, and others—all feel the Federal Reserve Board has gone too far, that the soft spots in the economy are such that tighter money could mean trouble. No one foresees disaster ahead, and everyone concedes there's a lot of bounce in the economy that could offset the softness in autos, housing, and the like.

BAC sees a softening

This assessment of the outlook for business was the one generally held by the top industrialists and businessmen who met with Cabinet officials at the recent meeting of the Commerce Department's Business Advisory Council.

In fact, they see the strong likelihood of a slight downturn in third quarter, as measured by Gross National Product. This could come, they feel, from such things as fewer orders in steel and autos, as buyers use up their inventories.

The BAC members told the government officials that they see the soft third quarter followed immediately by a fourth quarter upturn.

Long-term, the businessmen take the planned increase in capital spending charted in the McGraw-Hill Survey as a conclusive sign of the strong undercurrent of confidence in the long-term trend toward prosperity and business expansion.

Problem: money for expansion

Upsurge in loans to business was one of the things the FRB had in mind when it raised the interest rates for business borrowers. BAC members and administration officials alike express confidence that the Federal Reserve Board will ease the credit situation if it turns out that money isn't available to finance some of the capital expansion that's being planned.

So far, BAC members indicate, they've heard of no company that's had to cancel a planned expansion in capacity for lack of financing.

Ban turbodrill deal with Reds...

Commerce Dept has turned thumbs down on Dresser Industries Inc's proposed deal with Russia, exchanging technical data on rotary rock drill bits used in oil wells. The firm had applied for an export license to ship information on design, production, assembly, and operation of its heat-resistant, fine steel alloy drilling bits. In return, Dresser was to import Russian turbodrills, a piece of oilwell equipment US makers have been trying to perfect for years. So far, Russia is willing to ship Dresser the drills only in exchange for its alloy bits.

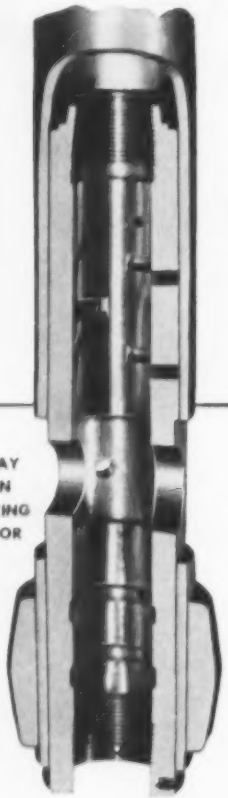
Defense orders for small firms...

The Pentagon claims about 37% of defense procurement goes to small business—either as prime contracts or "first-tier" subcontracts. Defense Dept officials made the estimate for the Senate Small Business Committee which has just started an investigation of small firms' share of military procurement. The Pentagon said "assuring an equitable opportunity to compete for defense business to small business concerns is the very heart of (its) small business program." The program consists of set-asides for prime contracts and a new subcontracting plan. Program has not really gotten off the ground.

MICROHONING*

with self-dressing abrasives generates consistent *Functional Surface Finishes*

Microhoning, the low-velocity abrading process consistently produces part after part exactly to your specified surface finish requirements, because the abrasive grits always remain sharp.



CUTAWAY SECTION OF STEERING ACTUATOR

Monroe Auto Equipment Co. designed its power steering unit to withstand rugged use while maintaining sensitive control. In the final processing of the hydraulic steering actuator, Monroe chose Microhoning to obtain diametric accuracy, consistent finish and to generate geometric precision.

The rough and finish Microhoning operations removed .005" stock from an interrupted bore 1.125" in diameter and 6⅜" long.

MATERIAL AND HARDNESS: SAE 1118 steel, Rockwell 45-50C

TOLERANCES: size—.0003"
roundness and taper—.0001"

FINISH: 25 microinches or less

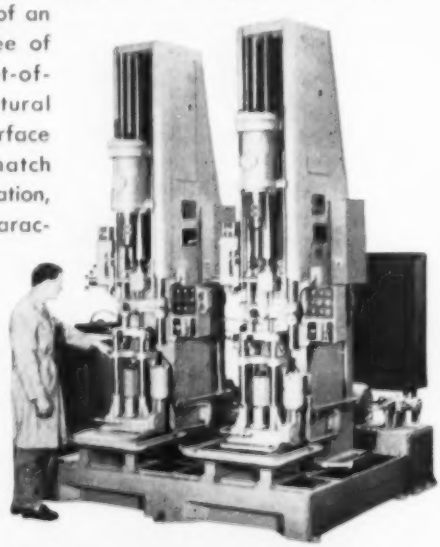
CYCLE: rough Microhoning—35 to 40 seconds
finish Microhoning—15 to 20 seconds

MACHINE: Double-column Model 740 Hydrohoner

SELF DRESSING ACTION OF THE ABRASIVES . . . is accomplished by the rotation and reciprocation of the Microhoning tool—the combined motion continuously changes the direction of force on the abrasive grits and keeps them dressed.

EFFICIENT STOCK REMOVAL . . . results from the many sharp-cutting grits acting simultaneously over a wide area of work surface. In this manner, the effect of heat is also minimized. Of all production processes, Microhoning least disturbs the sub-surface structure of the work.

FUNCTIONAL SURFACE CHARACTERISTICS . . . are obtained in one uninterrupted cycle. Microhoning generates accuracy within millionths of an inch . . . surfaces free of waviness, taper, out-of-roundness and structural stresses . . . uniform surface finish and a cross-hatch pattern for best lubrication, sealing and wear characteristics.



For more details on this application write for CROSS-HATCH Vol. 8, No. 1

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Detroit ... NEWS REPORT

How bad *is* the auto picture?

It's bad, and it's going to get worse before it gets better. You can't slough off the fact that auto output dropped in the second quarter, instead of rising as it should and has in any year of generally prospering economy.

The second quarter's 15% drop in output isn't the worst of it by any means: *third quarter output will run to about 1-million units — 40% below the second quarter!*

Detroit has already been declared a "labor surplus area" by the government. It'll be much more so before the '57 models come out this fall.

Automotive parts makers are feeling the pinch in centers like Cleveland and Chicago, where some of them are thanking their stars that they've diversified into non-automotive fields that will keep them going through the slump.

Tightening credit isn't helping, either. In fact, some Detroiters say business would pick up immediately if the Federal Reserve Board would untighten the screws.

Why? Why? Why?

What's happened to cause the slump? Publicly, auto industry spokesmen are adopting a Pollyanna-ish "I just can't understand it" attitude.

Privately, they have their own ideas. But practically none of them will admit to less horse sense than the man on the street, who for the last year or so has been asking "Who's going to buy all these cars they're putting out?"

GM even today denies "over-production in '55." Harlow Curtice has said, "We (at GM) have never indulged in over-production. At the end of the 1955 model run, our dealers had on hand less than 2% of their year's supply—and we shoot for about 3%."

That's all very well for '55 but what about the '56 models glutting dealers' showrooms?

They've got to sell them by the time the new models are introduced — at least most of them. And the auto industry is doing the only thing it can about it: working out a production rate that will cut back new car inventories half-a-million units by September — let the layoffs fall where they may.

There are a couple of other reasons advanced by automen for the slump, too:

Some blame the slowness of spring this year, but GM's Harlow Curtice pooh poohs this by pointing out that weather in the West, Southwest and Southeast has been good, sales bad.

"Not enough change in the '56 models" is another popular reason. It could be true—AMC's completely-changed-in-1956 Rambler is selling at a good rate.

Downward revisions of predicted 1956 output have gotten a lot of publicity — like GM's revision of its all-industry crystal ball gazing from 6.5 million to 5.8-million units.

Less newsworthy but a fact nonetheless is this: 1956 will be autodom's third best year. Actually, its 5.8-million units are a lot more normal and in line with the economy generally than 1955's blazing over-production and sales.

But there is a bright side, too ...

• **Potentially, the future auto market is solid.** Detroit automotive men aren't nearly as worried over the long-range outlook for the industry, as observers in distant cities seem to be.

• **At 1955's end,** upwards of 52-million cars were registered in the U S. Normal rate of attrition, the so-called "scrapping rate," is close to four million cars a year. The population curve is going up. This means that as kids come of car age they're going to buy jalopies first, then better and better cars—finally new ones. That insures the used car market, a necessary prop for a healthy new car market. And at this writing, U S used car inventory stands at less than 25 days' supply, countrywide, a low figure.

• **The auto industry has faith in the future.** Proof? It's not curtailing 1956-1957 expenditures in the least, despite a falling market. More proof? Autodom's colossus, GM, originally planned to spend $1 billion on capital goods this year. Actually, it will spend several million more than that.

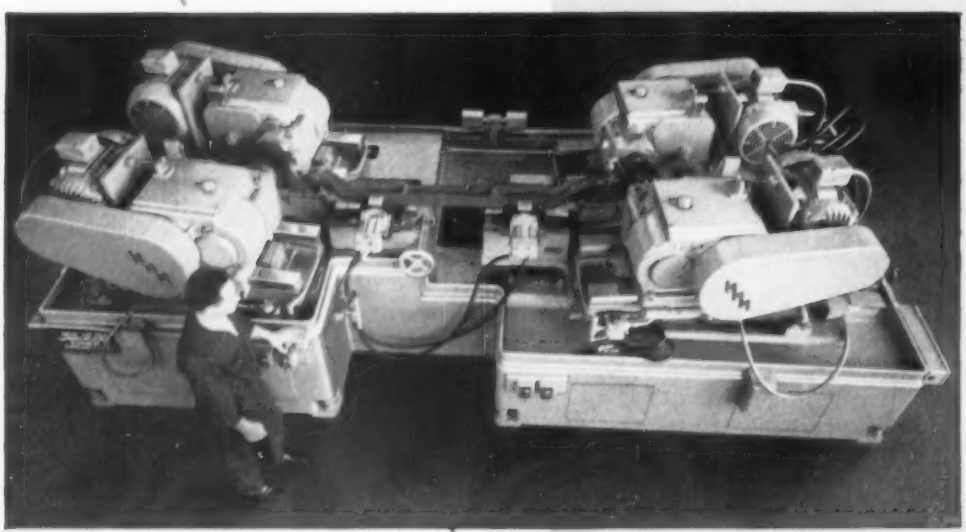
• **1957 is expected to be a "good" year.** Introductions of '57 models won't be delayed. And although several auto people say too much publicity about what's to come in '57 models is hurting '56 sales, the public will be wooed back into a buying mood with some pretty fancy improvements.

To quote Ford Economist George Hitchings, "A repetition of the 1955 total of 7.3-million new cars purchased was not to be expected in 1956 . . . In the six years prior to 1955, customers bought an average of 5.3-million new cars annually . . . a sudden shift to 7.3 million sustained average was unlikely . . . The new car market is currently absorbing cars at somewhat less than a 6-million annual rate . . . Indications are that the adjustment to more normal levels of buying has been completed."

MIGHTY BIG JOB

MINIMIZED by another

MOTCH & MERRYWEATHER *Production Solution*

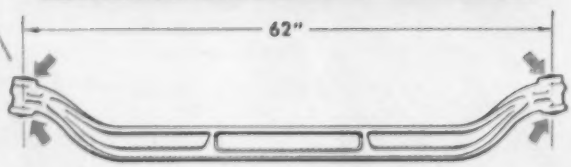


Traveling head universal double duplex milling machine.

Four faces of a part are milled simultaneously by this universal-special machine. Mill faster, more accurately, at less cost with a head for each surface. Motch & Merryweather engineers can design universatility into special equipment. Thus, machines performing a specific task can be quickly adapted to a variety of sizes. Have M. & M. study your next job with a view to broadening the usefulness of ostensibly special equipment.

Write for Bulletin S-56 describing M. & M. Duplex Milling Machinery.

YOU'RE AHEAD WITH A HEAD FOR EACH SURFACE



Operation: **Milling kingpin bosses of truck axle.**
Material: . . . . . **Forged steel.**
Brinnel Hardness: . . . . . **217-255.**
Machine cycle time: . . . . . **30 seconds**

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-off, Milling and Special Machinery

Machine tools ... NEWS REPORT

Orders still pour in ...

April machine tool orders were at close to a $1-billion-a-year rate. They amounted to $83 million, to be specific, down some $12 million from March. If you take out cancellations, new orders for April totaled $78.4 million.

Builders of metal-cutting machines received orders for $380 million in the first four months of this year. That represents a whale of an increase over the $238 million for the same period of '55.

Incoming business since October 1, immediately following the Machine Tool Show, adds up to a whopping $767 million.

Hard to get production up ...

No progress at all was made in April in raising production. Shipments were $71.8 million, down a little from $74.1 million in March. No dent has yet been made in the towering backlog that is now equal to more than 8½-months' operations at the current rate of output.

It seemed a sure bet at the beginning of the year that machine tool shipments this year would get up to $1 billion. At this point, attainment of that goal is very doubtful.

To reach it, the industry would have to produce in the months from May to December inclusive monthly shipments averaging $92 million, or $21 million more than April's actual figure.

There probably is a better chance that orders will hit the $1-billion mark than that production will. Sales for the eight months from May 1 to December 31 will have to average out to $77 million a month to do this.

That is a lower figure than has prevailed at any time in the first four months of 1956. The record to date: January $115 million, February $86 million, March $95 million, April $83 million.

Russians want machine tools ...

Soviets would like to buy $100-$125 million of machine tools from the British in 1956-1960 (the dollars presumably are figured on the basis of British machine tool prices which are much lower than American).

The Russian proposal is broad enough that it could be interpreted as a desire to purchase machines not just in Britain, but in the free world.

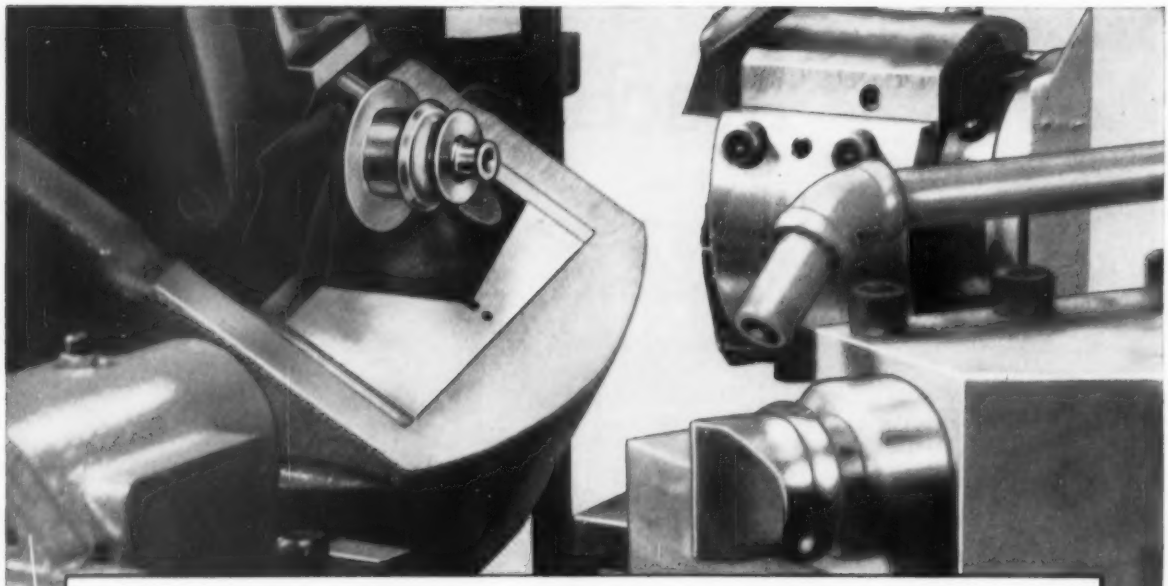
Some $75-$100 million of the machines on the Russians' shopping list are transfer machines.

They also want 500 "special and multiple-head" machines, 100 universal pattern millers, 80 broach and spline grinding machines, 50 gear cutting and shaving machines.

They would like to order the following machines on which there now is a complete embargo to iron curtain nations: 40 optical profilers, 40 thread grinders, 10 gear cutters (up to 160 in. dia.), 25 gear planers (up to 64 in. dia.), 25 multi-spindle profile millers, 45 jig borers, 40 four- and six-spindle automatic lathes, 30 straight-side mechanical forging presses (capacity 6000 tons), 70 straight-side mechanical forging presses (capacity 200-2000 tons), two extruding presses, 10 hydraulic forging presses and three steam or air drop hammers of 15-tons' falling weight.

The Russians also would like to secure certain machines partially embargoed or the classification of which is undetermined for shipment to communist countries. These machines include 40 planetary grinders, 50 steam or air double-action drop hammers with falling weight of 4-6 tons, and some 16 plate and section straightening machines.

ORDERS CONTINUE AHEAD OF SHIPMENTS on the Index of the National Machine Tool Builders' Association. New orders in April stood at 282.4 and shipments at 242.8. Only 6.8% of new business came from foreign sources



From PROBLEM to PROFIT

in just 3.59 minutes . . . with a

POTTER & JOHNSTON 6DRE-40

Automatic Chucking Turret Lathe

HERE ARE THE FACTS

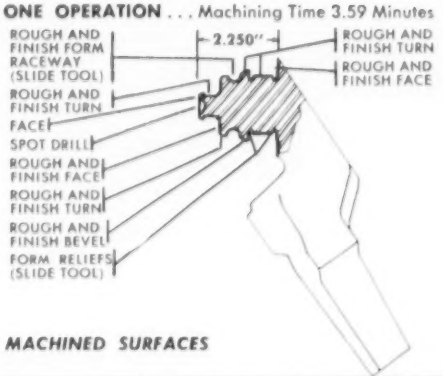
PART: Cutter Bit Arm

MATERIAL: 4812 Steel Forging

REQUIRED: 18 separate, precision cuts . . . including some "fussy" single point form turning.

COMPLETED: Quickly, economically in 1 completely automatic cycle!

ONE OPERATION . . . Machining Time 3.59 Minutes



HEAVY LINES INDICATE MACHINED SURFACES

And remember, this is *not* an exceptional, "done-for-the-record" case history. It's a regular production job that typifies the day-in-day-out performance you can count on because a P&J 6DRE-40 has the advanced design, added rigidity, extra speed and power, and versatility to take tough jobs in stride. And when you team this P&J Automatic with tooling engineered by P&J Specialists, you really have a cost cutting, profit building combination.

SEND NOW FOR COMPLETE INFORMATION

Write today for your free copy of Bulletin No. 159 describing the P&J 6DRE-40 in detail. Complete engineering data is included.

Precision Production Tooling for more than Fifty Years

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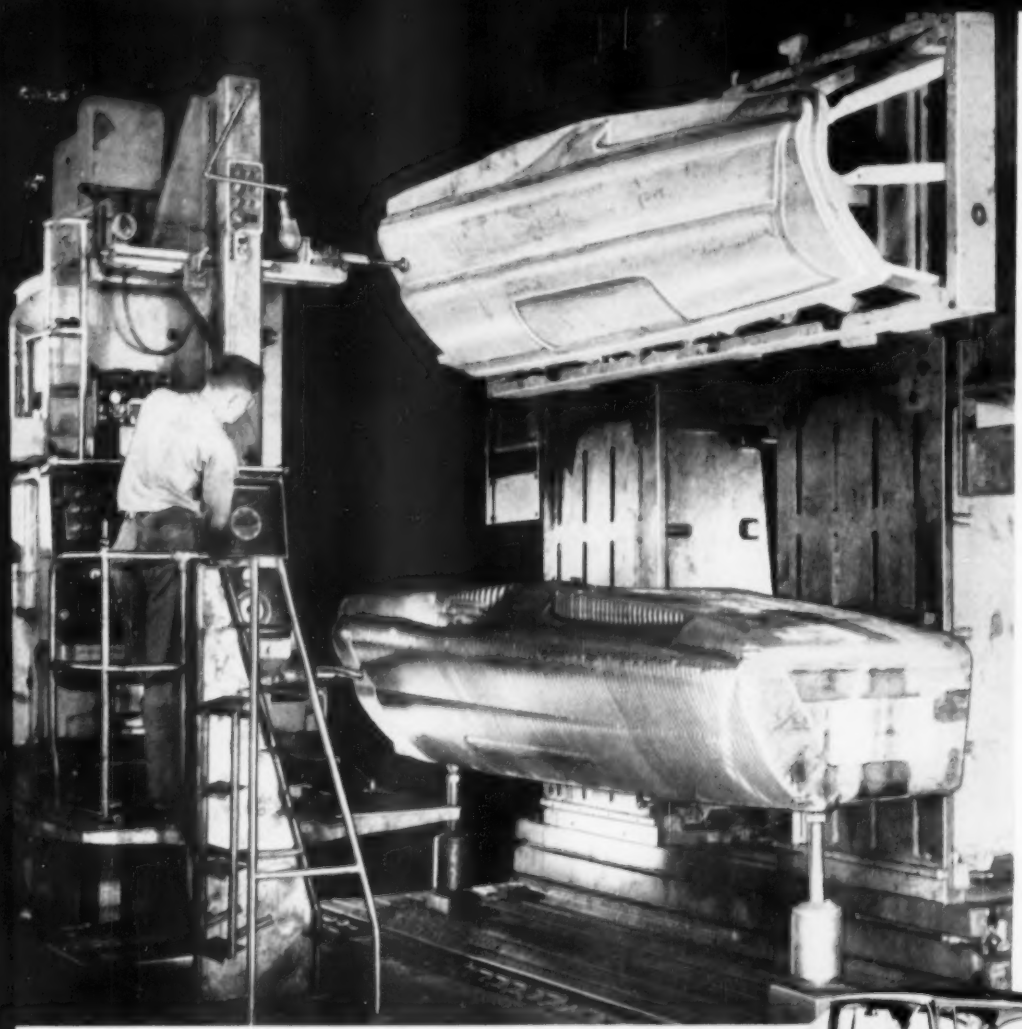
MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT



Helps put the "B-G" in the BiG New 1956 LINCOLN

. . . the PRATT & WHITNEY KELLER Type BG-22

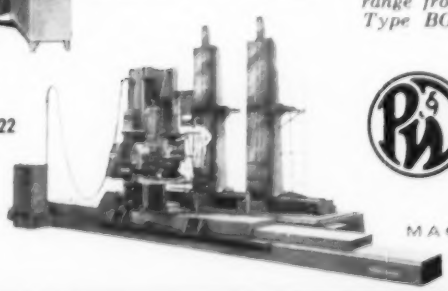
Hallmark of Lincoln styling is a distinguished, lithe, trim look with gracefully flowing lines. Producing the huge dies that faithfully translate the designer's drawing board dream into a reality of smoothly formed metal is just one of the jobs done so well by Pratt & Whitney Keller Automatic Tracer-Controlled Milling Machines. Shown here is a big Keller Type BG-22. Following a plaster model, it sculptures the complex contours of a rear quarter panel in solid metal . . . quickly, exactly and, above all, economically.

SMALL . . . or LARGE

There's the right size Keller Machine for every plant, for every job. Capacities range from 36" x 20" (for the compact Type BL) to 20' x 7' (for the giant Type BG-22). Write for complete information outlining your requirements.

TYPE BL

TYPE BG-22



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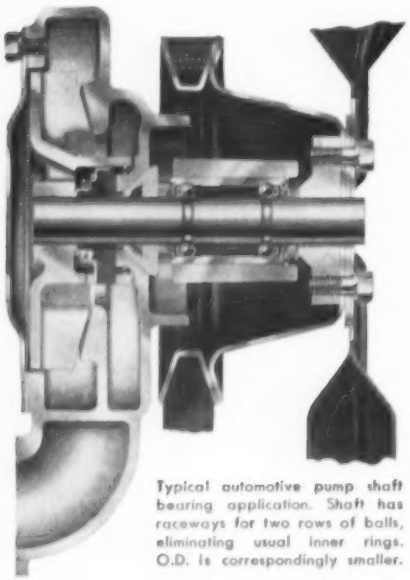
MACHINE TOOLS • GAGES • CUTTING TOOLS

FACTS

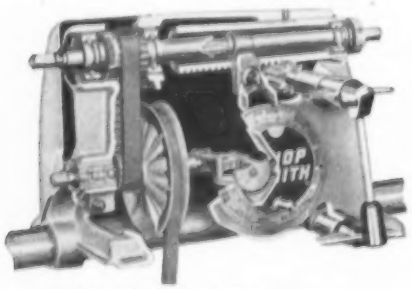
about

NEW DEPARTURE

BALL BEARINGS



Typical automotive pump shaft bearing application. Shaft has raceways for two rows of balls, eliminating usual inner rings. O.D. is correspondingly smaller.



Integral shaft of bearing serves as intermediate shaft in Magna's "Shopsmith". Assures fewer parts, easier machining, more accurate, quicker assembly.

For each McCulloch Mower, New Departure provides two pump shaft bearings with hollow shafts to permit vertical adjustments. Special heat treating gives full hardness at the raceways but adequate toughness in the shaft to withstand hard service.

FAN AND PUMP SHAFT BEARING IS ADAPTABLE TO MANY USES!

This sealed and "lubricated-for-life" bearing with integral shaft was originated by New Departure specifically to simplify automotive fan and water pump mounting. Since its inception, it has reduced bearing maintenance requirements to virtually zero in millions of car, truck and other engines.

Because of its unique design and ability to locate parts on its shaft against loads from any direction, designers find it a highly *versatile* bearing, adaptable to many other uses.

The manufacturer of a well-known power tool, which combines several tools in one compact unit, employs the pump shaft bearing as a complete intermediate shaft with pulleys on one end and a keyway for tool attachment on the other, with obvious design and performance advantages.

Another manufacturer produces a power mower in which two of these versatile NEW Departures with hollow shafts not only support the mower rotors, but permit vertical adjustment of the wheel spindles to regulate cutting height.

So here is another NEW Departure adaptable to many uses. New Departure engineers can show you what it and other ball bearings will do to improve your products.

FINE BALL BEARINGS MAKE GOOD MACHINES BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

What's ahead ... in Metalworking

NEWS REPORT

Metalworking likely to do well this summer ...

The metalworking industries will give a good account of themselves this summer, despite the sharp slump in automobile production.

It won't be quite like the summer of 1955, when output rose in July, again in August and still further in September. That was extraordinary.

But don't overlook the fact that Metalworking is going into the summer season at a slightly higher level than it went into the similar period a year ago. From this point on, however, it is likely to slip a bit as the summer wears on.

Drastic cuts in automobile operations alone are bound to force downward Metalworking's production curve. The relatively poor performance in the farm implement field won't help either.

More than that, soft spots in household appliance sales and production are showing up, though they are not alarming.

Solid floor under metalworking ...

That brings one back to the same old story: The boom in capital goods is still on and is providing a solid floor under metalworking business.

There are no signs up to now of any tendency toward a slowdown in the placing of orders for machinery of all kinds.

Machine tool sales in April were off somewhat from March, but were still very big in dollar volume.

Orders for material handling equipment have risen impressively, the latest month's figure representing a new high over a three-year period.

The industry now is confident that its average this year will be higher by more than the 10% predicted last December.

A poll of tool and die shops, taken by National Tool & Die Manufacturers Association, reveals that 76 shops view the outlook as excellent (compared with 34 a year ago), 181 as good (116 in 1955) and 51 as fair (against 140).

Electrical machinery builders say that they have enough business to run at top speed throughout the year. In such massive products as turbines, they will be pushing their plants to full capacity the next two years.

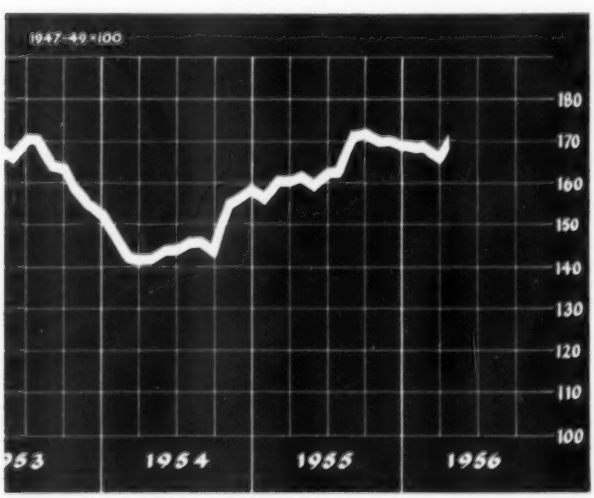
Steel production to drop ...

The rush is still on in steel, but not because customers are using up the tonnage so fast. They are hoping to beat any steel price increase (a steady hike is expected) and to insure themselves against consequences of a possible steel strike.

Steel mill finishing departments are being pressed so hard to get out tonnage that many of them scheduled work for Memorial Day and for Saturdays the next few weeks.

But steel operations are destined to ease in the third quarter, the dip amounting to about 15% for the industry. Nothing has happened to change the belief that the rate will bounce back up in the final quarter.

The third quarter will be the year's low point for automobile production. The slump will be so great that it is almost sure to drag down American Machinist's Production Index with it.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

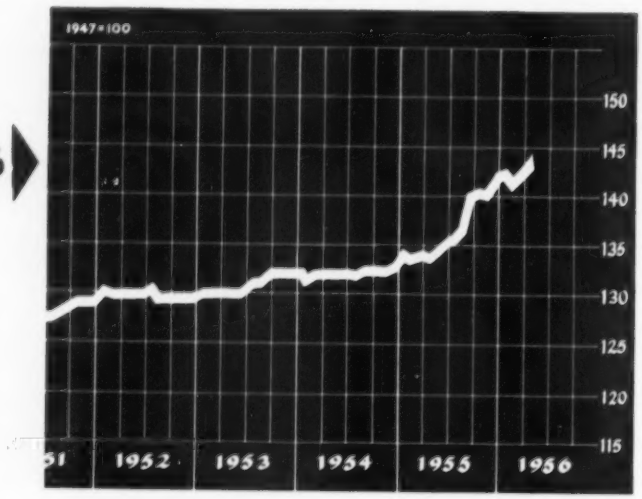
	MAY Estimated	APR Preliminary	MAR Revised	APR Year Ago
Total Index	**171**	**170**	**167**	**160**
Machinery	158	146	130	
Electrical Machinery	204	191	185	
Autos	131	134	156	
Other Transportation	310	310	272	
Other Metalworking	139	137	132	

NEWS REPORT

What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAY Estimated	APR Preliminary	MAR Revised	APR Year Ago
Total Index	**143.6**	**143.3**	**142.1**	**134.5**
Metalworking Machinery	164.0	162.2	146.4	
Other Machinery exc. Electrical	149.3	148.7	139.2	
Electrical Machinery	140.8	139.1	131.6	
Fabricated Metal Products	137.8	136.4	130.8	



4th quarter rise to offset 3rd quarter drop . . .

Things are not quite what they were. That's for sure. There are areas of weakness, with Detroit the glaring example. And the tightening of credit is bringing cries of anguish from many sources, including high administration officials in Washington. There is not the bounce in the situation that formerly existed.

Yet all these developments should not be allowed to obscure the fact that the nation is in the middle of an unprecedented boom in capital spending for plant and equipment.

The year as a whole continues to hold the same promise that it did earlier: Business will be off in the third quarter, but some recovery will take place in the fourth quarter.

The best that one can anticipate is that 1956 will be as good a year as 1955 (what more do you want?) rather than the record-shattering period predicted at the beginning of the year.

Inflation is cause for concern, though business appears to be tapering a little.

Industrial prices have risen appreciably the past year. Wholesale prices also have gone up. More wage boosts are in the cards and higher steel prices seem to be almost inevitable. If steel goes up, that will set off a chain-effect of price rises in various products using steel.

Inventories in general are no less a worry than they were a few months ago. In fact, they are at the highest point ever known.

The employment situation, except in a few distress areas, shows no signs of any softening. There is a continued shortage of skilled help almost everywhere. No immediate change is looked for.

Perhaps the most acute shortage is in the engineering field. No relief is in sight.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	145.8	146.4	143.2
Steel ingot production (thousands of tons)	2,379	2,345	2,326
Electric power output (million Kilowatt hours)	10,875	10,837	9,730
Production of automobiles and trucks	141,957	141,513	221,936
Engineering construction awards (Eng. News-Record—millions)	$310.3	$300.2	$402.7

MONTHLY BUSINESS INDICATORS

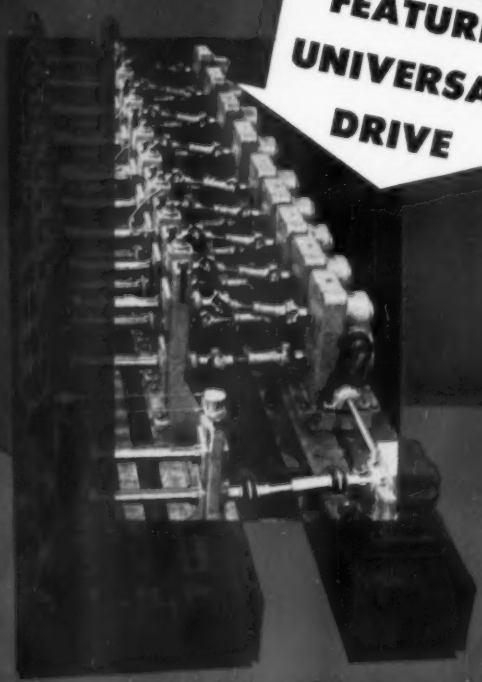
	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	142	141	136
Index of durable manufactures production (1947-1949 = 100)*	159	157	151
Durable goods manufacturers' sales, millions*	$13,344	$13,593	$12,860
Machinery manufacturers' sales, millions*	$ 3,599	$ 3,647	$ 3,318
Durable goods manufacturers' new orders, millions	$13,357	$14,107	$13,353
Machinery manufacturers' new orders, millions	$ 3,793	$ 3,953	$ 3,404

*Seasonally adjusted

LEADING THE INDUSTRY IN DESIGN . . .

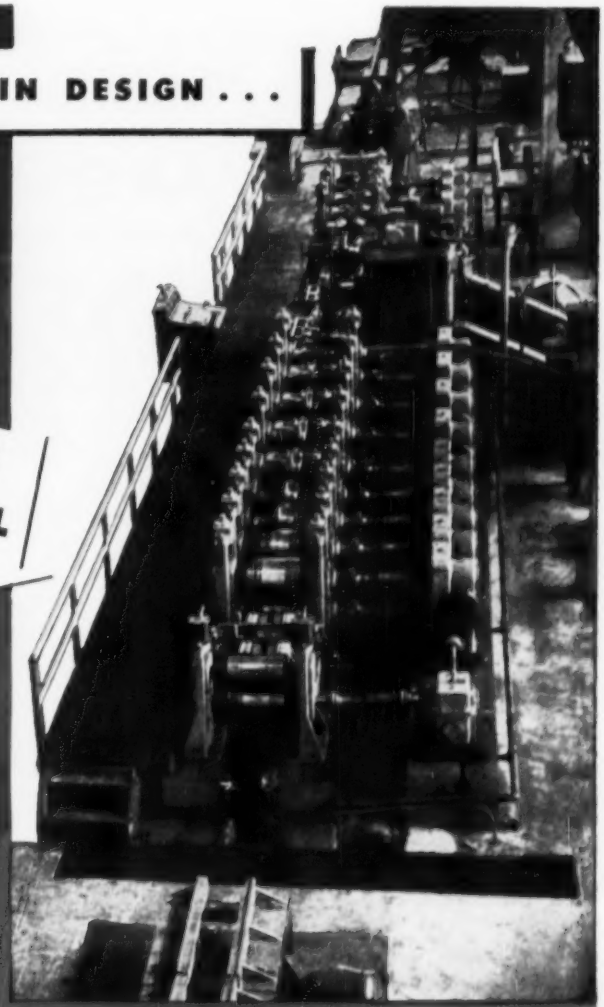
Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive

You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.



PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced*. Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

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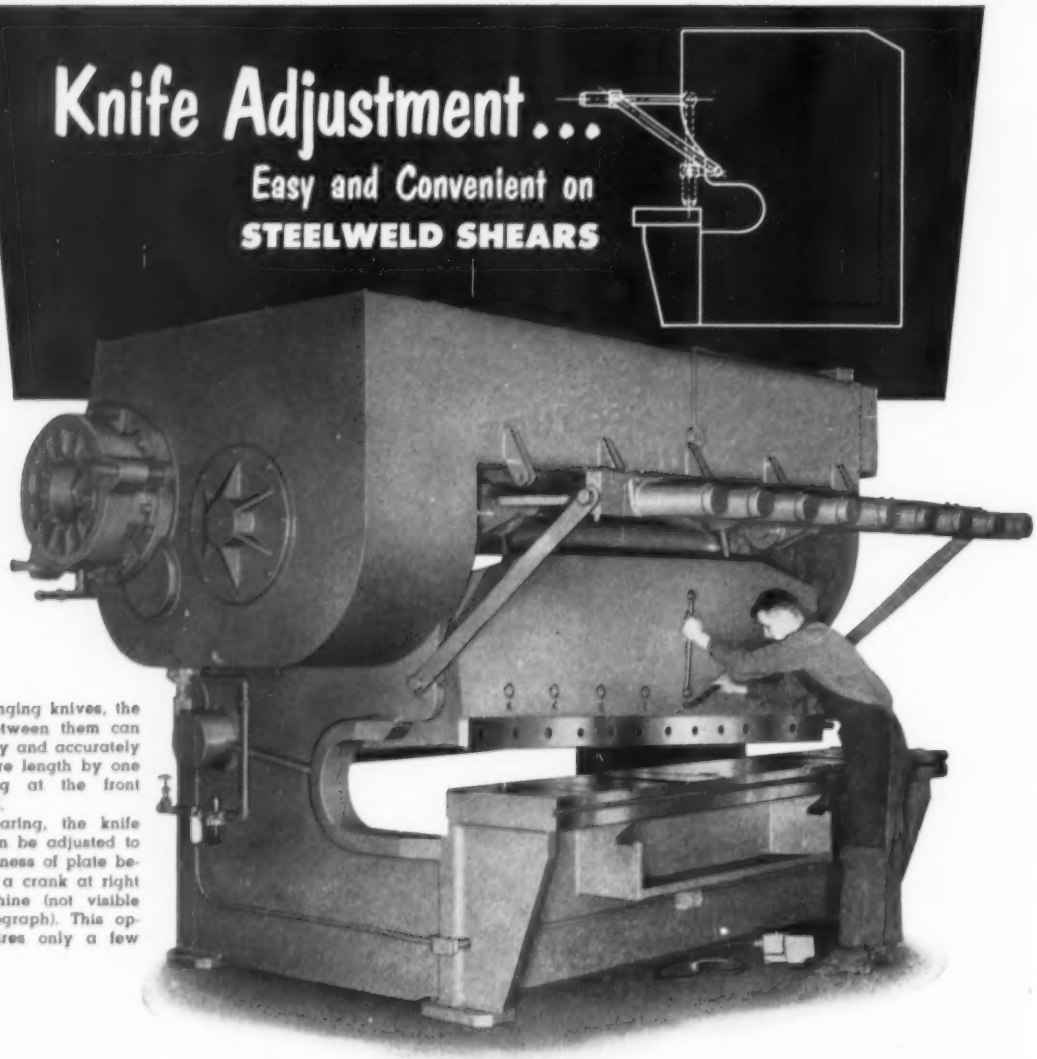
Knife Adjustment...

Easy and Convenient on STEELWELD SHEARS



When changing knives, the clearance between them can be set quickly and accurately for their entire length by one man working at the front as illustrated.

When shearing, the knife clearance can be adjusted to suit the thickness of plate being cut with a crank at right end of machine (not visible in this photograph). This operation requires only a few seconds.

When the knives on a Steelweld Shear are being set parallel from one end to the other, it is not necessary to have one man at the rear of the machine turning adjustment bolts, with another man at the front gauging the knife clearance. Nor is it necessary to work between or behind the hold-downs in hard-to-reach places.

On Steelwelds the hold-down beam can be lifted out of the way and all knife adjustment bolts reached from the front of the machine. As each bolt is turned, the clearance can be checked at once. One man can make the entire adjustment in a small fraction of the time usually required.

After the knives have been set for parallel, the clearance between them can be adjusted to suit various plate thicknesses to obtain the best possible cuts. This can be done in a few seconds by turning a crank and watching a dial indicator.

Because knife adjustments have been made so convenient on Steelwelds, shear operators will make them gladly and without hesitation. This contributes greatly to accuracy and quality of cuts and assures long knife life.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1438 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Head it off

Now that B & K are back in Moscow from their less than triumphant visit to London, automation has unexpectedly been catapulted into the British limelight. The ensuing furore should give us pause.

Standard Motor Co is retooling to build a new tractor and, among other things, is installing transfer machines. Union stewards suggested that during retooling, all men work short time. The company refused, saying that it planned to lay off 3000 and to keep the remaining work force on a full schedule. The employees feared that some of the men made idle would never be recalled. At this point, the union pulled out 11,000 men on strike.

Everybody got into the act . . .
at that time. The Labor party's deputy leader warned that trade unions must have a voice in planning the changeover in the "age of nuclear power and automation" (shades of Walter Reuther).

The Oxford District Council of the Amalgamated Engineering Union expressed concern at the attempt to bring to this country the American way of introducing automation—to sack a complete plant, retool and automate all processes, then recall a third to a half of the workers originally employed."

Automation found staunch supporters, however, in the spokesmen for the Trades Union Congress and for the government.

It is no good blindly resisting . . .
automation. The TUC general secretary said that in his lifetime he did not think that 10% of industry would be run by pushbuttons. The danger of unemployment in Britain would come not from being up-to-date but from being out-of-date, the Minister of Labor asserted. But if management intends to make important technological changes, it should consult its employees from the beginning.

Prime Minister Eden, in Parliament, declared that "a continual and steady improvement in our own industrial techniques is necessary in order to preserve our competitive position in the world, to maintain full employment and to insure a continuous rise in the standard of living. These developments are therefore to be welcomed, including those coming under the general heading of automation." He further stressed that the government hopes that industry will invest in new types of machinery to the fullest possible extent. The real danger of unemployment lies in not doing exactly that.

All of this is no laughing matter to us over here. It is the kind of flareup that could occur in this country overnight if conditions were right for it and if interested leaders were in the mood.

Best way to prevent it . . .
is to tell honestly and simply, with facts and figures, the benefits stemming from automation. It is no good for manufacturers to imitate an ostrich whenever the subject of automation arises. They should proclaim its virtues, which are plentiful, to everyone who will listen.

Make no mistake, mechanization (a less glamorous word for automation) has provided American workers with their present solid buying power and high standard of living. The more we mechanize, the better off the workers will be. And so will all of us. Every manufacturer and every industry should hammer home this truth to employees, to neighbors and to all the citizenry.

Burnham Finney EDITOR

PUNCHING

104 holes every 10 seconds *accurately*

The multiple punching of these holes must be very rapid, and their location as well as spacing must be held accurately.

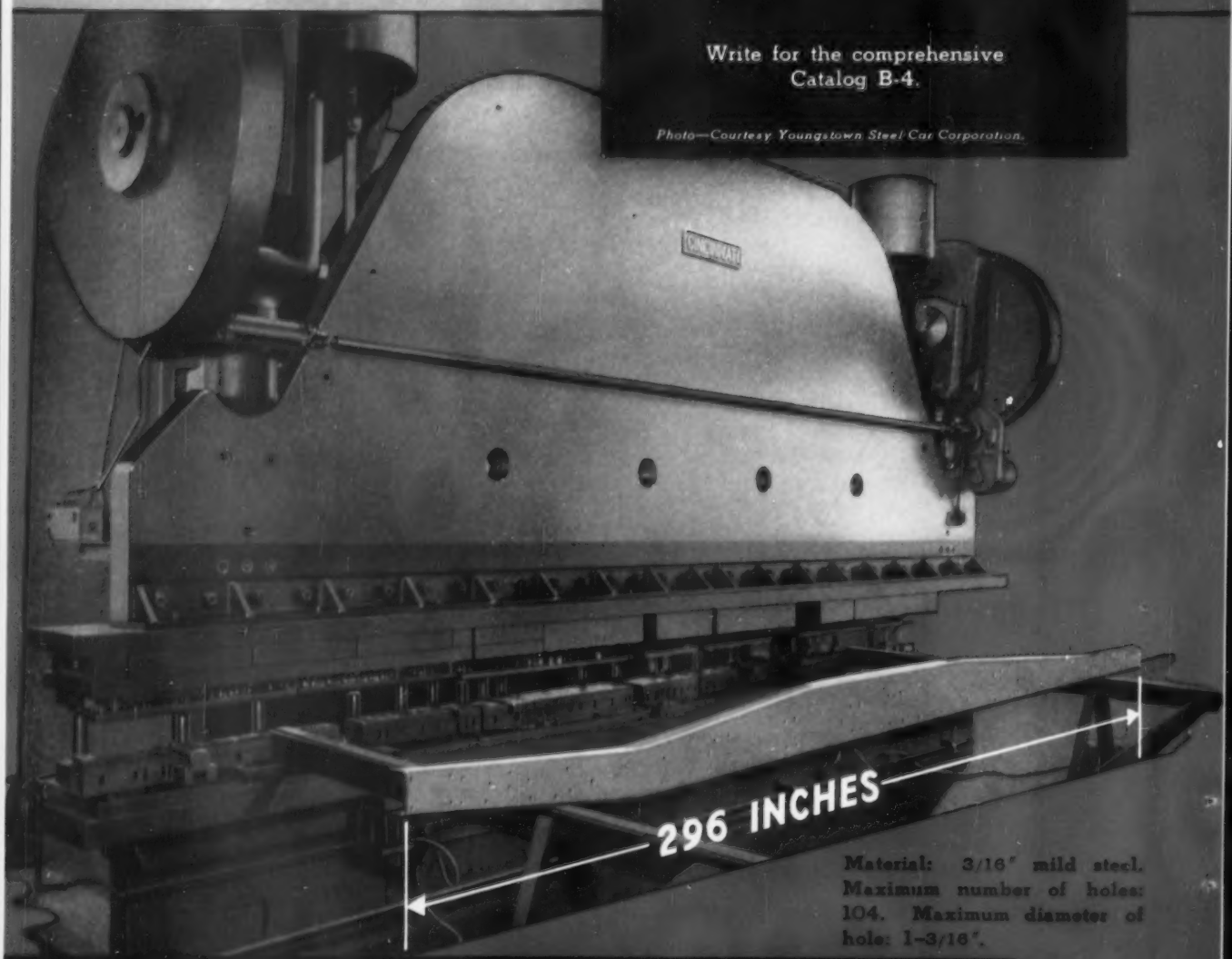
The assembly of these 24' trailer frames is smooth and economical with no costly hand fitting.

With this punching equipment, position, size and spacing of holes may be changed quickly and at low cost.

The Brake can perform many other operations as desired converting from one operation to another quickly and at low cost.

Write for the comprehensive Catalog B-4.

Photo—Courtesy Youngstown Steel Car Corporation.



Material: 3/16" mild steel. Maximum number of holes: 104. Maximum diameter of hole: 1-3/16".

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

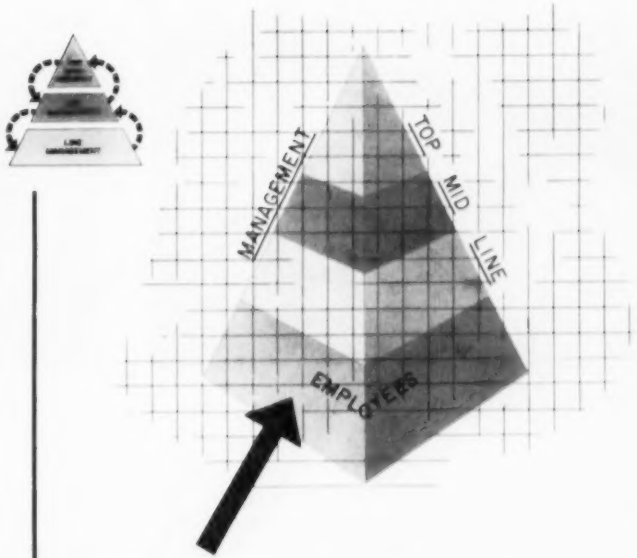
What Has Gone Before...

About a year ago, Jack & Heintz set up a 3-level management training program unique in its approach to the developing of supervisory personnel. (AM—Apr 25 '55). Management personnel on the middle level, (supervisors in charge of large subdivisions of major departments) established 12 basic management objectives:

1. Budgeting: control of expenses
2. Discipline: maintenance of productive relationships among people
3. Equipment: proper use of available facilities
4. Housekeeping: administration of orderliness and cleanliness
5. Induction: timely establishment of employment requirements
6. Organization: achievement of a management team
7. Placement: assignment of the right person to the right job
8. Productivity: efficient attainment of plans and schedules
9. Progress: self-development of the individual
10. Quality: realization of acceptable employee and product performance
11. Safety: promotion of hazard-free work conditions
12. Training: instruction and education.

Line management (supervisors in charge of plant departments) developed ways to achieve these objectives and the methods were reviewed by mid-management, then approved by top management.

Working as small teams, each with several of the 12 objectives as their assignment, members of line management presented their ideas of how to achieve these objectives to other teams as well as to groups on other management levels. The program gave foremen and supervisors a broader conception of their jobs and the relationship of these jobs with other supervisory jobs and the problems of top management. Similarly, top management got a closer look at other-management-level problems. Key to the success of the program was active participation of all concerned. Result was uniform understanding of management responsibilities and problems at all levels as well as the development of a sense of teamwork. Symbolically, the program was represented by a 3-layer pyramid (see above left).



Now Jack & Heintz puts the base on the training pyramid

GEORGE De GROAT, associate editor

Now a broader base has been added to the training-program pyramid at Jack & Heintz to include other employees. Because management objectives can only be achieved through the effort and cooperation of all employees, complete understanding of these objectives is necessary all up and down the line. The "management job" becomes the "organization job" and the 12 "management objectives" become "organizational training objectives."

To reach various levels of the organization, select employees representing all manufacturing and service divisions were assigned the job of studying the 12 original objectives. To be as fair as possible in selection of those who could take part at the start, a bulletin-board notice announced the program and stated that the number of people who could be accommodated was limited by available facilities. This procedure permitted individuals to volunteer and avoided selection of specific people—a practice that might have been criticized. Moreover, it eliminated complaints from those who did not volunteer. Over 160 people volunteered, with the result that group sizes were expanded beyond original plans.

Organization objectives are explained to employees by their own

. . . first, a team selects data . . .

. . . the talk has management review . . .

One of the four groups involved is a team of 11 new foremen not included in the original management-training program. These men were selected by a committee from mid-management. Hourly paid employees—26 of them—comprise a second group called "Employees," while a like number of non-supervisory salaried employees make up a third group called "Specialists." The fourth group is made up of hourly paid employees from 16 departments in the plant.

HOW NEW FOREMEN LEARN

The new foremen, as a group, first study and review the 12 objectives, meeting once a week for one hour. From material developed in the original program they examine the origin, meaning, and application of these objectives—finally reaching an understanding of the scope of the whole program. After this, each new foreman is assigned a specific objective on which he is to prepare, then present, a talk explaining "what to do" to achieve it. He selects from the group one other new foreman to help him. After preparing, the new foreman, with his associate, presents the material to his own group. In successive weekly meetings, each new foreman presents an objective and after each talk the entire group takes part in discussion.

DEPARTMENT EMPLOYEES TAKE PART

Hourly paid employees from 16 different production and service departments meet every month for ½-hr sessions with their individual foremen. The Management Committee, made up of mid-management members, recommended that individual line foremen outline the organizational training objectives to their own department employees. Foremen were selected on the basis of their ability to be effective and the needs of individual departments. After selecting objectives of special interest or significance to his own department, a foreman is briefed on this assignment, then prepares a half-hour talk which he first presents for review to a group of general foremen. Here it is criticized, toned down, if necessary, pointed up to suit his group, and otherwise modified to suit the particular department that is to discuss it. About a week later he presents the talk to a group of superintendents for their review and comments. A final "dry run" takes place when the Training Dept hears his presentation.. Here, foremen who have spoken previously sit in to add comments based on their own experiences, and foremen who will speak later also attend to hear the talk and learn from the comments and criticisms they hear.

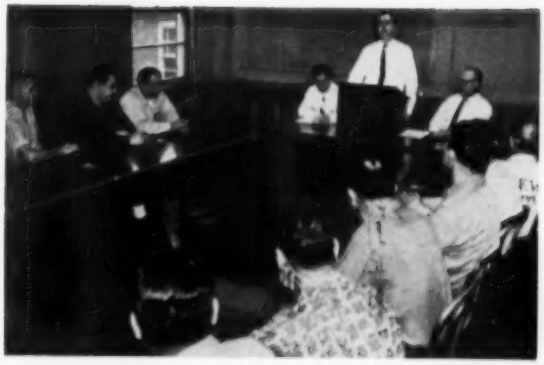
George Kenning, Rutherford, NJ, management consultant who organized these training programs, is usually present at these sessions, as is Carl F Herbold, assistant to the president and industrial-relations director. Company superintendents also serve as members of the training department so the presentations (after passing this review) are about as good as they can possibly be made. Visual aids and illustrative material are provided as they are needed.

Finally, the foreman calls a meeting with his department and makes his presentation. Although these meetings are relatively short, followup and clarification of essential points are made as necessary. Employees participate by criticizing, asking pertinent questions and commenting on the topics. In general, they show considerable enthusiasm. They learn, for example, why Maintenance takes care of machines at certain intervals instead of more frequently (or less frequently), why 10% or 30% of a production run is inspected (or why some parts they make get 100% inspection). Questions an operator would seldom take time to ask are aired here, as are criticisms of some departmental functions. A closer relationship between the foreman and his department is developed and his group feel considerably more at ease about approaching him on many other subjects because they know his views and what his problems are. Communication is thus established among all concerned.

Foremen learn a great deal about the problems of individuals in the department, learn how to talk to them more easily. Of course, their ability to handle day-to-day problems is increased as the result

foremen . . . after training

. . . then a dry run to other foremen . . .



. . . now it's ready for the men

of a better knowledge of their department and the improved communications. An important byproduct of the program is the fact that foremen become aware of their own shortcomings in preparing and presenting these talks and naturally try to improve themselves to set good examples.

"EMPLOYEES" AND "SPECIALISTS"

The other two groups taking part are the "Specialists" (tool engineers, process engineers, production coordinators and other salaried technicians) and hourly paid organizational "Employees" from all production operations. These include assembly men, tool and die makers, machine operators, and inspectors. Each group operates individually but along the same lines, meeting weekly for one hour and taking part in discussing presentations made by teams of foremen. The foremen, selected by the Management Committee, do not include those previously assigned to talk to departmental employees in order to avoid overlapping and also to give more people an opportunity to participate. Selections are made on the basis of those who *should* participate —to improve themselves—as well as to include those who show ability along these lines.

Teams of two foremen each are made up, each team having one of the 12 objectives as an assignment so that 24 line foremen are involved. Mid-management "Resource Men" who took part in the previous management-training program review the material prepared by each team, suggest revisions, criticize, comment, and generally help refine the presentations. At least two such counselors are assigned each team and make sure they get plenty of practice. The advisors are assigned teams with subjects different from those they studied previously themselves so their own experience is broadened. In addition, one new foreman is assigned each team for training experience.

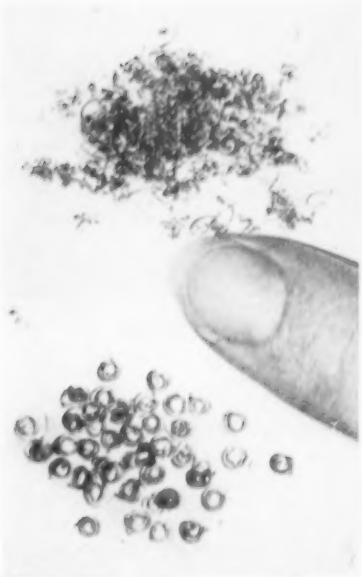
The teams first work up material on their individual objectives with the resource men, then try out the presentation before the group of new foremen. The second presentation is to the specialists, the third to the other group of employees. In this way each team makes three presentations, each time modifying its talk slightly to suit the audience.

Specialists and Employees, of course, are given opportunities to ask questions, discuss the objectives, and make any pertinent comments. They become aware of what is expected by management, their interest is stimulated and they learn more about their own relationship to the organization as a whole. Many in these groups, of course, are slated to become foremen and supervisors themselves, so the talks and discussions help them understand more of the responsibilities that go with these positions.

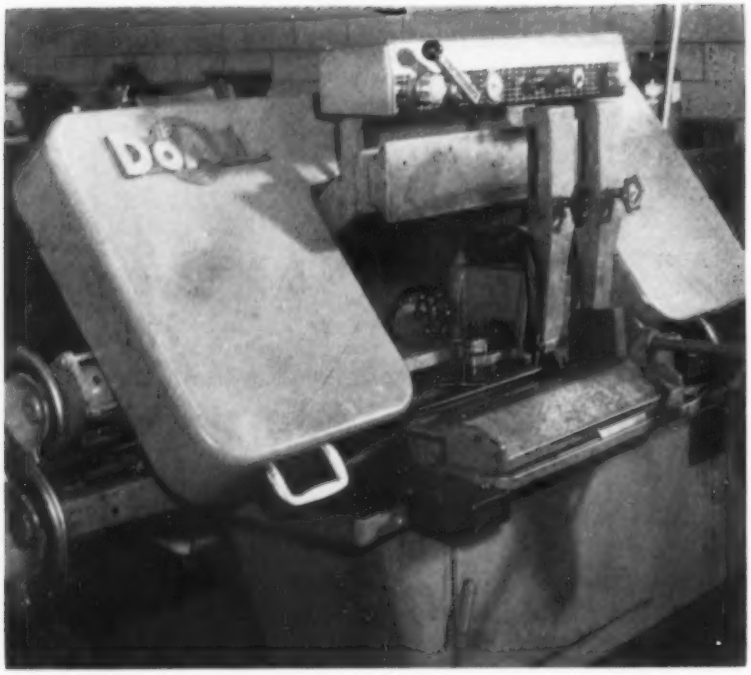
PROGRAM HIGHLIGHTS NEEDS

Of course, reactions vary with individuals taking part. Some people feel they don't need such instruction or they accept the program casually or even indifferently. Some may even feel the speaker is not sufficiently gifted as an orator to be worth their time. The majority, however, are extremely enthusiastic — care less for the idiosyncrasies of the individual speaker than they do for what he says. The consensus is that the presentations are far better as a means of communication than a regular editorial in a house organ signed by the president or a once-a-month speech over the plant loudspeakers. Foremen, though they may not be orators, talk "nuts and bolts" — and the employees understand them and listen. Employees as a whole feel they have an opportunity to discuss problems, talk freely on a give-and-take basis and learn how to improve themselves. Many have asked, "Where can I get books on this subject?", "How can I go about learning to read blueprints?", or "What subjects should I study to advance more rapidly?"

In general, the program has benefited management personnel as well as employees and has highlighted shortcomings and qualities on both sides. Main advantage, however, is the sense of common objectives all through the organization and the feeling among all Jack & Heintz people of being on the same production team.



STRINGY CHIPS (above) show inefficient cutting with original bandsaw blade. Curly chips (below) are a different story, made after the blade was reground



DO-ALL C41A WAS TOOLED with carbide-tipped blade guides for close blade support, and with extra blade-pressure bearings. Slower speed, 40-60 fpm, was provided, and machine was run with full-gravity feed

BANDSAWING TITANIUM:

You can get 10 times normal

There's a prime law for bandsawing titanium stock: Slow speed, heavy blade pressure. But this doesn't mean a thing if the blade teeth don't actually get in and cut. A new setup method and revised tooth grind for standard HSS bandsaw blades improves cutting efficiency and points up further changes in blades and machines that would help more

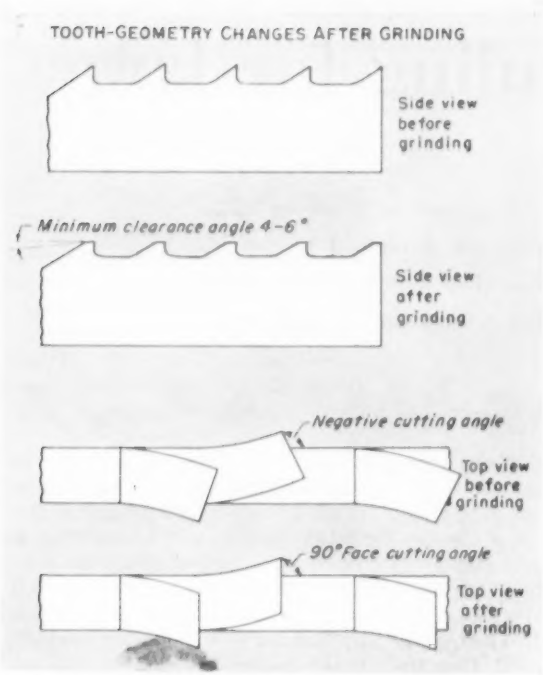
L. O. MONTGOMERY, supervisor, Machinery Services, and G. WILLIAM BAUER, supervisor, Metallurgical Research, MALLORY-SHARON TITANIUM CORP., NILES, O.

Bandsawing is a desirable titanium-working process. It wastes little stock, and doesn't burn the metal. Bandsawing also handles odd shapes and sizes easily, and allows the cutting of test specimens to close tolerance. But standard HSS blades can't cut some hard grades of titanium.

Machine-shop research proved that standard bandsaw blades *could* be used if the blade contours were reworked and the machine setup changed a bit.

Standard blades, 1 in. wide, 1/16 in. thick, and 12 ft long, were reground as illustrated to make them dig into the stock better. This operation costs about a quarter of the price of the new blade; but it makes considerable difference, and new blades should be reground immediately before being installed on the machine.

As with any bandsawing, blade pitch depends on



TOOTH TIPS WERE GROUND OFF, clearance angle added, and face cutting angle adjusted on standard bandsaw blade. This provided better tooth strength and shearing action

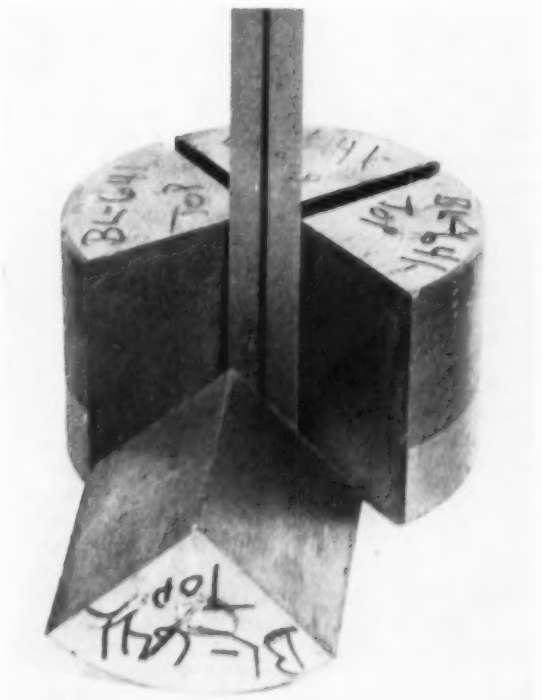
SOME TI ALLOYS ARE AS HARD AS 48 R., so blades had to be hardened to 50 R. down to the fillets between teeth. MST 6A1-4V alloy, hardness around 30-38 R., can be cut at rate of ¾ ipm

blade life

stock thickness. Most commonly applied pitches are 6 (precision) for light cuts and 3 (buttress) for thicker stock. As much as 400 sq in. of stock has been removed before a second regrind. Hardness of the alloy doesn't make much difference in cutting rate; but coolant is applied to the softer grades, like unalloyed MST III, to prevent chip loading.

Changes to the machine were beefing-up measures, designed to support the blade closer to the cut, and more firmly.

Results of these shop tests indicate some changes that would make bandsawing titanium even better. Thicker blades could be used; and tooth-hardening processes could use tighter control. Machine rigidity is important; and better control over the slower ranges of blade speed would improve operations.



QUARTERED 6-IN. BILLET OF TITANIUM shows good cut surfaces. Blades with new contours last 10 times as long as previously, and can be reground three or four times if they're caught before failure

Production scheduling for large

Systematic scheduling of ship production has cut building time as much as 25%. This procedure, which can be applied to any large unit, was developed by the author starting in 1935. It was applied during World War II to 80,000 vessels, abandoned, reinstated during the Korean War, is still being refined and applied today

HERBERT M. NEUHAUS, technical assistant to the director, U S NAVY SHIPBUILDING SCHEDULING ACTIVITY, PHILADELPHIA

Although the features described in this article were developed for shipbuilding, the principles involved are applicable to any large structure such as a major machine tool, a factory building, a complete refinery facility, a locomotive, or a similar item that must be designed and assembled from its base elements upward. A ship is, without question, one of the most complicated creations of man. Because of this complexity it requires months to design and build.

Studies leading to the production principles described in this article were initiated in 1935 for single and multiple ship production and were based upon production and accounting data that had accumulated in the Navy Department subsequent to World War I. The basic feature revealed by the studies was that, although shipbuilders built by different methods, their erection sequences were so similar that an erection sequence for one shipbuilder would fit another's operations.

Oversimplifying, one may consider a shipyard as a final-assembly line of an industrial plant with supporting shops and the industries supplying materials as subassembly lines; conveyor lines being local material-handling facilities, railroads, trucks, canal barges, and the roads these use. All of these must be synchronized to assure that what is needed arrives when it is needed and at the place where it is needed.

The base upon which scheduling is developed is the ship the customer wants and the date it is wanted. Once the base has been determined, detailed production planning can proceed. The quality of planning is dependent upon the talent and experience of the shipbuilder. From experience data, based upon hundreds of ships built and conferences with shipbuilders, the following principles have evolved:

1. That for the same type and design of vessel, the sequence of erection of its component parts is generally the same, no matter who the builder is and notwithstanding the method of construction.

2. Within limitations, the point in the actual construction period of a vessel when an item should be landed for assembly in the rising structure is in constant ratio to the building period no matter who the shipbuilder or what the length of the building period.

There may be remote exceptions to these principles for specific and unusual cases, but these do not weaken the principles.

A destroyer will serve as an example. Under the first principle, our planning can disregard whether the vessel is built in a private or government shipyard; whether it is going to be built piecemeal, of large weldments, on a "conveyor-line" setup, or upside down. In addition, the second principle tells us that the relative portion of the actual construction period when the item is landed will be the same whether that period is 25 or 30 months. If the anchor windlass is required at 15 months on the 25-month ship, it will be required at 18 months on the 30-month ship, or at 60% of the construction period. From a study of past erection performance on various vessel types, uniform erection sequences with consistent percentages of landing in vessel can be developed for each vessel type from the mass of data available. An erection sequence table is shown in Fig. 1.

The second problem is to establish a building or construction interval. To many this period is the interval between laying of a vessel's keel and its completion. This overlooks the preparatory work prior to keel laying which begins long before the keel is laid; on a large aircraft carrier some eight months before. During wartime, when vessels are being turned out in an uninterrupted production sequence, that "pre-keel period" becomes remarkably constant. For a cargo vessel or destroyer it averages four months, with a half-month plus or minus tolerance.

Knowing when ways become available by prior launchings, the sum of the keel-completion interval and the pre-keel period will give the total construction interval. We consider the start of construction as that point where the shipbuilder picks up the first piece of material and begins to work it into the required form for incorporation into the vessel structure.

The percentages of Fig. 1 applied to the construction interval will give the months from start of

Note: The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

units

construction that an item is needed for landing in the vessel. In a typical case the construction interval may be 28 months—4 months pre-keel and 24 months keel to completion. The main turbines, Item 50 on Fig. 1, are required at 58% of the building period. 28 multiplied by 58% gives 16 months from start of construction that the turbines are needed by the shipbuilder. If the proposed keel-laying date is July 20, 1956, and the pre-keel period 4 months, the start of construction is 4 months earlier or March 20, 1956. If to this is added the interval of 16 months computed above, the date of July 20, 1957, results when the turbines are required. Statistical reduction of past performance data has indicated a tolerance of 15 days plus or minus in the computed date. This is a permissible error, compensable in the course of construction.

By computing required dates for other required components and materials such as hull steel, weldments, etc, a dated erection sequence becomes available. If the time for local shipyard fabrication, pipe bending and flanging, plate cutting and shaping, machining of shafting, etc; component and material manufacturing lead time; local order preparation effort; and ship working-drawing preparation are given reasonable lead allowances, dates for the starting of each of these events can be reasonably estimated and tabulated beforehand for a complete schedule.

Compilation of tables of constants from past performances for these intervals in addition to the percentage tables of erection for the vessel has given a ready means for computation of these necessary dates by electric accounting machines. Fig. 2 is a simple chart showing how the required dates of landing are computed. Preceding dates such as shipping, ordering, etc, are realized by a series of

MATERIAL ERECTION SCHEDULE

1630-Ton Destroyer

Erection Order	Item	Percentage Quasi-Bldg. Period	Fabrication Interval Days Before Landing
1	Hull Steel, Group I	15	45
2	Stuffing Tubes, Electric Cable	20	
3	Foundations, Main Propulsion Machinery	22	
4	Hull Steel, Group II	25	45
5	Hull Steel, Group III	26	45
6	Tank Heating Coils	27	30
7	Piping, Fuel Oil Tank & Vent	28	30
8	Piping, Feed Water Tank & Vent	30	30
9	Stern Tubes	32	30
10	Struts, Shaft	34	60
11	Hull Steel, Group IV	35	45
12	Bearers & Supports, Rudder	36	75
13	Boilers, Main	38	90
14	Doors, Hatches, Manholes (Below Main Deck)	39	
15	Hawse Pipes & Chain Pipes	40	75
16	Cable, Electric, Power & Lighting	42	
17	Heaters, Deaerating Feed	45	
.	.	.	
.	.	.	
.	.	.	
50	Turbines, Main Propulsion	58	
.	.	.	
.	.	.	
.	.	.	
90	Store & Issue Room Equipment	73	
91	Fans, Desk & Bracket	75	
92	Heaters, Electric	77	
93	Searchlights	79	
94	Shop Equipment	82	
95	Outfit, Portable	85	

FIG. 1 . . Erection sequence table for a destroyer

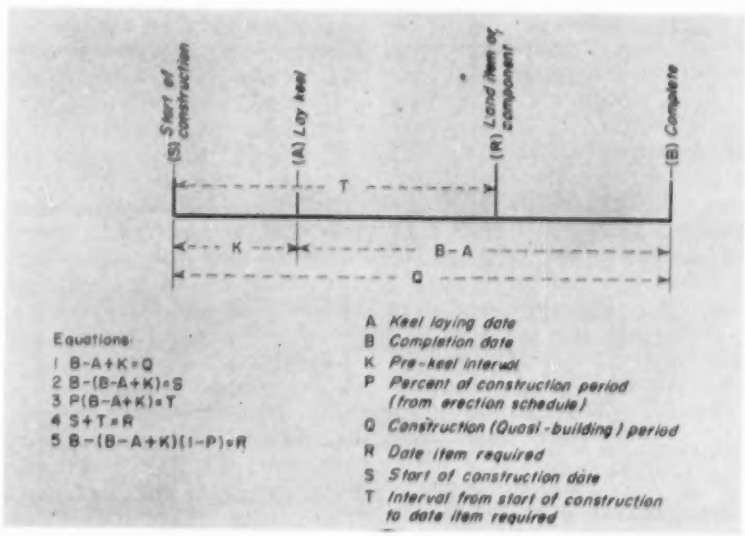


FIG. 2 . . Formulas for determining required completion dates of components

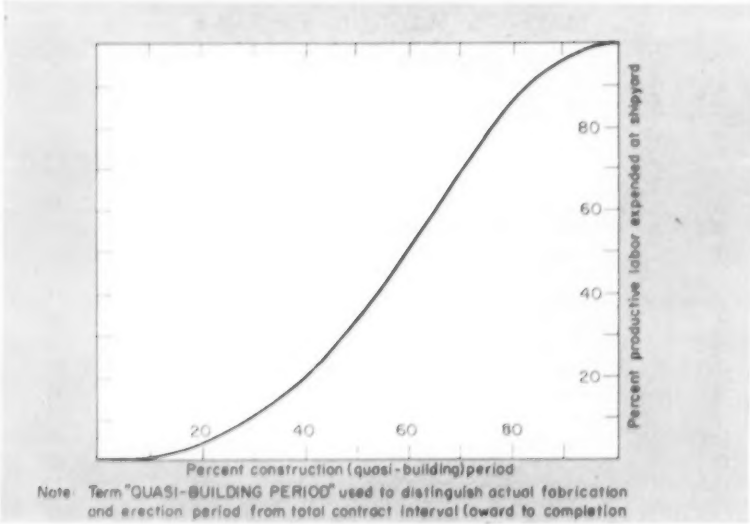


FIG. 3 . . Curve of erection progress. Slope of curve indicates labor demand on the builder

single subtractions. For a few items exception to this method of computation must be made. It occurs when certain fittings are needed before launching. Launching, being governed by local conditions, may be early in the construction period. This may require tail shafts, propellers, anchors, underwater sound fittings, and other underwater appendages ahead of their normal time.

A feature pertinent to the scheduling of erection—and measuring its progress—is the curve of erection progress. This curve, S-shaped, having its origin at the start of construction and termination at the completion represents by its vertical ordinates the productive labor expended on the vessel (shop and ways) by the shipbuilder. Horizontally, the abscissas measure time elapsed during the construction interval or percentages of building period. The approximately straight, central section of the curve delineates that interval where the greatest amount of labor is expended on the project. At the point of inflection maximum labor demand occurs. These features are indicated on Fig. 3. Within this central section the greatest numbers of components are installed and greatest amount of labor expended.

The gentle gradient leading into the S represents preparatory and rough work, layout, and setting up. Easing of the slope at the top of the S results from the reduction in personnel as major work completes, touching up, final testing, trials, and correction of work found necessary as a result of trials.

The S-curve is typical of all large construction projects, not ships alone. Although its shape is quite regular for each vessel type, changes in the shape emphasize economic problems to management. If the entry is too long, gradual money loss and delay are represented, the money loss by excessive overhead and delay by an extension to the construction interval which is difficult to reduce without extensive overtime. A very steep center section represents excessive labor charges, and most generally, an optimistic and generally impossible erection progress. A long flat terminal section shows too much time used for testing and correction.

For planning purposes the erec-

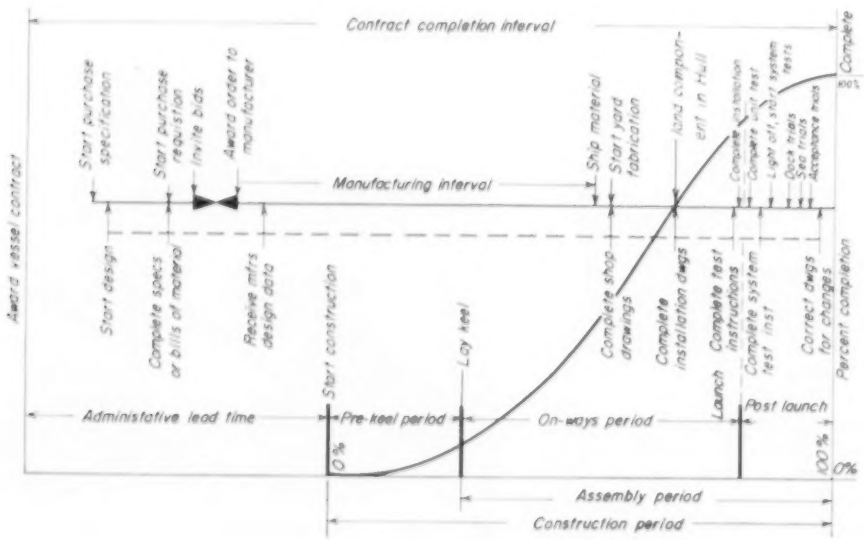


FIG. 4 . . Scheduling elements combined in a single drawing. Administrative lead time is greater for a new design than for a repeated design

tion curves must agree. Each item lands in place at a specific point of the curve. Deviations from a smooth curve indicate that the erection has not been wisely planned unless good justification exists. A situation causing distortion is that where the shipbuilder has much steel fabrication capacity, little steel work in his shops, and something must be done to hold the steel fabrication and erection crews. In such cases when a new contract is received, the situation is partly relieved by fast initial construction, slowing down eventually as the machinery components, wiring, piping, and other ship components begin fitting into the hull.

Fig. 4 relates all of the items described thus far to a single generalized diagram. The unusual element of this figure is the "administrative lead time" that must be expended prior to beginning construction. For some new vessel designs, this interval is greater than the actual construction interval. As the vessel increases in size and complexity or if it is a completely experimental unit, administrative lead time decreases in length and ratio to the construction interval. It also decreases if the vessel is a modified or repeat design. In the latter case the tail of the S shortens as the "bugs" uncovered in the previous vessel have been rectified.

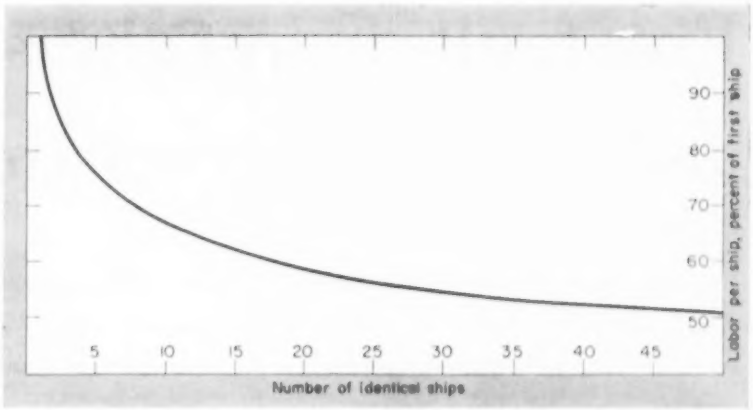


FIG. 5 . . Reduction in labor for repeat production of the same design in the same shipyard. This curve, based on actual experience, follows the standard "learning curve" form

PLAYING IT SAFE

A singular, though prevalent, feature revealed by the building-time studies is that most shipbuilders want their major components such as turbines, boilers, and other machinery in the shipyard long before they are actually needed for erection. In almost every case investigated this desire has stemmed from a previous bad situation where the shipbuilder has had his working force ready and needed parts have not been received. Granted that this precaution appears justifiable because of possible additional labor costs and the necessity for leaving large access holes in the structure, the attitude does cause severe counter-penalties. Not the least of these is interest on investment. A set of turbines for a vessel may cost $500,000 (or more). At 6% interest, the carrying charge for a 6-month early delivery is $15,000, not including the cost of special storage, preservation, and extra handling which can easily add another $10,000.

Worst of the counterpenalties is the burden upon the component manufacturer. In many cases his quoted time of manufacture is a minimum limit, including shift work and allowing for his peculiar procurement and production problems. A marine reduction gear, for example, is a 3-shift production problem, peacetime or emergency. Once the gear cutting machines have started to cut, they are not stopped until a full cut has been completed. On a 10-ft dia gear with a 4-ft face, this machining time can be considerable.

Turbine rotor forgings are in a similar category. Net result to the shipbuilder is that he penalizes himself, for he cannot place orders until he receives a vessel contract. Since his vessel delivery date is specified, he must either build around the item leaving sufficient access (and interference), put in overtime, or delay the ship delivery. Where the shipbuilder receives progress payments during the course of construction, the interest on investment is shifted to the buyer. When the government is the purchaser, it means the taxpayer must bear the cost of this zeal.

LEARNING CURVE

Repetitive vessel construction introduces problems as reduction of time and cost for succeeding vessels. Fig. 5 is a curve, also developed from returned data, showing the reduction in labor resulting from multiple production in the same shipyard for the same design vessel. Note that the 30th vessel should require 55% of the labor expended on the first vessel. The data is applicable to other large structures built in one shop or in the same construction area on a repetitive basis. Similarly it shows the reduction in time that may be expected for building successive units. Because of the decremental nature of the curve a limiting minimum time-cost is evident beyond which little or no reduction can take place without radical changes or automation.

One of the most valuable features that has stemmed from this production scheduling procedure is the means to mass schedule ships in a large shipbuilding program, accumulating requirements for specific materials, and matching these against manufacturing capacity available. A second benefit is the establishment of shipbuilder goals beforehand, both by dates materials are needed and predicted labor that should be expended. These give the user a gage by which he can accurately measure his progress to date and determine early prospective areas of trouble.

Five faults in wet abrasive cut-off... and how to correct them

Precision cut-off with wet abrasive machines can be a precision operation. When it isn't, wheel drift, heavy burr, burning, step cut or chamfer may result. Here is the cause and cure for these common troubles

P. C. DOOLEY, assistant manager, Grinding Laboratory, Abrasive Engineering Branch, THE CARBORUNDUM CO., NIAGARA FALLS, N. Y.

Where a high quality of cut is desired, wet cutting-off operations, using rubber-bonded abrasive wheels, are growing in popularity. When proper wheel grading is selected, and the wheel is used correctly on a properly adjusted machine, excellent cuts are obtained.

The drawings show cut-off faults that do not have to be determined by chemical analysis or measured by complicated instruments. Corrective actions are relatively easy.

WHEEL-FACE BREAKDOWN

The first and most important thing to consider is wheel-face breakdown. Cutting off is a form of plunge grinding, and it is commonly observed in dry cut-off operations and in form grinding that the corners of the wheel face breakdown first. This happens because the corners have less support and are weaker. It does not happen on a properly set up wet cut-off operation with rubber-bonded wheels. Water flushing down the sides of the wheel keeps the sides of the wheel, hence the edges, cooler than the center.

Wear or breakdown of a rubber-bonded wheel is caused by normal attritional or rubbing wear like any other grinding wheel, but in addition, the heat of the cut burns out or weakens the rubber bond, thus accelerating the wear at the center of the wheel where it is hottest. On a wet-cut-off machine with a large amount of water directed equally on either side of the wheel, it is common to observe a pronounced inverted V in the face of the wheel.

Another important controlling factor in wheel-face breakdown is wheel grade or hardness. All other things being constant (grit size, amount of coolant, etc) the harder the wheel grade the more shallow the V shape and the wheel face. In the hard-rubber-wheel grades, it is entirely possible that, even with a good supply of coolant, the wheel face will become convex or rounded just as it will in a dry cut-off operation. When this condition is reached it is a sure sign that the wheel is too hard for the operation.

COOLANT APPLICATION

With the exception of the totally submerged type of coolant application, two methods are common to deliver coolant to the wheel and work at the cutting zone. The first, we will call the two-tube system where two tubes or pipes, one on either side of the wheel, deliver coolant to the cutting zone. This system has the advantage of being inexpensive to install, but it has many shortcomings. It is difficult to adjust the tubes so that they deliver water to the right spot for a range of work sizes. It is also likely that, because the tubes tend to get in the way of loading and unloading stock, they will be made smaller than they should be.

The second method of coolant application is by means of water wings or deflector plates between which the wheel rotates. The water wings form a V with the converging ends toward the cutting zone, and into the larger end of the V an ample stream of coolant (30 gpm) is pumped.

This system has many advantages. The wings can be sufficiently far from the cutting zone to give unobstructed loading and unloading of work and yet project a high volume of coolant to the cutting zone. Probably the greatest advantage of water wings is the ease and accuracy with which they equalize the amounts of water reaching both sides of the wheel.

A suitable coolant for wet cut-off is plain water. If used without some additive, however, the machine and work would be subject to rust. Some rust inhibitor should be used. Most soluble oils perform well when mixed in solutions of 60 or 80 to 1 with water. Any highly alkaline solution might weaken the rubber bond and should be avoided. Solutions which foam easily should be avoided because this condition is magnified and aggravated by the churning, whipping action to which a coolant is subjected as it is introduced between the fast-moving wheel and the closely-spaced water wings or coolant deflectors.

A large supply of coolant is a distinct advantage in any wet-cut-off operation. A considerable amount of heat is generated during the cutting cycle and, without refrigeration in the coolant sump, the temperature of the coolant will rise rapidly. For example: a cut-off machine requiring 7 hp to do its work may raise the temperature of water in a 50-gal coolant sump

ing two short, unsupported canti- thickness, it would be well to

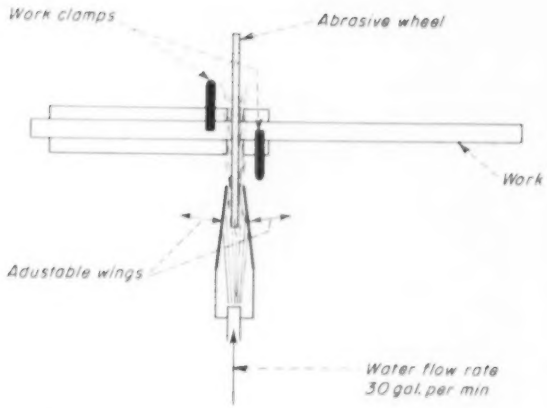


FIG. 1 . . Water-wing coolant application in a typical application as viewed from the top of the machine

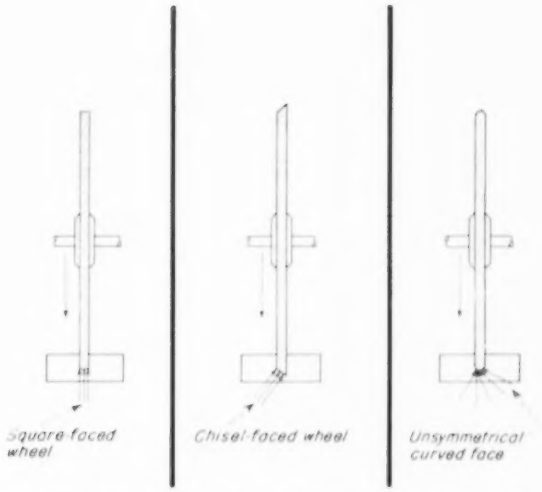


FIG. 2 . . . Effect of wheel face: Square face has reaction forces parallel to direction of wheel pull, no drift. Chisel face has reaction force at an angle causing heavy drift (to the right in case shown). Unsymmetrical curved face has a resultant reaction force at an angle causing drift (to the left in case shown)

as much as 20 F in one hour of cutting time. This could mean the difference between a burn-free cut and one with 10% of its area burned.

Tests in our laboratory indicate that refrigerating the coolant can improve the quality of cut considerably, but only a slight improvement in wheel life results because of two conditions which nearly balance. The lower temperature of the coolant cools the cutting zone, thus making the metal more difficult to cut. At the same time, it cools the rubber wheel, slowing down the burning-out action on the bond.

Cut-off operations, probably more than any other type of grinding, bury the cutting zone or wheel-to-work area in such an inaccessible fashion that it is nearly impossible to get the coolant into that area. Extensive tests showed that even a jet stream of high velocity aimed as closely as possible at the work-wheel contact area, combined with a flood of coolant, gave little, if any, better results than the conventional coolant application.

Even a flood of thread-cutting oil will flash into fire at the cutting zone, indicating that insufficient lubricating action takes place in the actual cutting zone to eliminate hot sparks.

It is obvious then, water with some adequate rust inhibitor is the best coolant for cut-off applications.

Now that the mechanics of wheel-face breakdown, and the methods of coolant application in wet cut-off operations have been described, we will discuss individual faults.

1 . . WHEEL DRIFT

Wheel drift is probably one of the most commonly encountered cut-off faults. Wheel drift causes the cut face of the work to be out of square with the axis of the work. Despite the fact that the axis of the work may be exactly at right angles to the wheel before the cut is started, and held clamped securely in this position during the entire cutting operation, the resulting cut face may be out of square by as much as $\frac{1}{8}$ in. in a length of 3 or 4 in.

This condition is caused by one of two possible things or a combination of the two. First, and perhaps the most common reason, is a chisel-shaped wheel face, or an unsymmetrical curved or rounded wheel face as shown in Fig. 2. The second reason could be too fast a down feed or too hard a wheel resulting in diaphragming of the wheel.

The chisel-shaped wheel face is almost always caused by unequal cooling of the two sides of the wheel. It is seldom caused by a wheel being softer on one side than the other.

Unequal cooling can be caused by directing more water to one side of the wheel than the other, in which case the water wings or coolant tubes must be adjusted to give equal distributions of the coolant. Unequal cooling can be caused by some projection of the machine coming in such close proximity to one side of the wheel that the coolant is wiped off this side of the wheel more than the other. Such projections may be one work clamp almost rubbing the side of the wheel and the other clamp a greater distance away, as shown in Fig. 3. It may be a part of the wheel guard that comes very close to one side of the wheel. It may be a piece of broken wheel wedged between the water wings.

Wheel drift can be caused by forcing a flexible wheel, such as a thin rubber cut-off wheel, through the work faster than it can possibly cut its way. This results in a partial diaphragming of the wheel, forcing it to cut in a curved path. It is amazing the amount of curvature on the cut face of the work that can be generated under these conditions and still not break the wheel. After several

wheel, it is common to observe a

wings form a V with the converging ends toward the cutting zone,

its work may raise the temperature of water in a 50-gal coolant sump

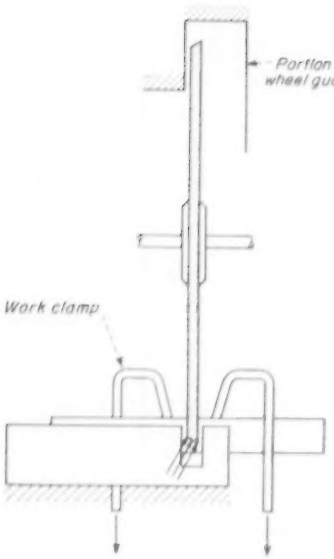


FIG. 3 . . Left-hand work clamped much closer to wheel than it should be, wiping coolant from this side and developing chisel face on wheel. Drift is to the right in this case. It could also be caused by portion of wheel guard too close to one side of wheel

cuts have been made under these conditions, radial cracks may begin to appear near the periphery of the wheel, and if cutting is continued, the wheel will soon fail completely.

Many wet cut-off machines have hydraulic downfeed which brings the wheel down at a predetermined rate, and if the wheel is not able to cut at this rate, breakage is certain to result. A properly adjusted machine will cut off 4-in. bar stock within 0.010 in. for squareness and parallelism, or 2-in.-dia stock within 0.005 in. squareness and parallelism.

2 . . HEAVY BURR

A heavy burr at the bottom of the work-face will require a secondary operation to remove it. A properly set-up wet cut-off operation should produce a burr light enough to be easily removed with the fingers.

When a heavy burr appears, look for a rounded wheel face. Fig. 4 shows clearly why a rounded wheel face causes a heavy burr. Note that the wheel cuts through at the center of the cut first, leaving two short, unsupported cantilever sections which, softened by the high temperature at this point, bend over easily and become heavy burrs.

The most obvious cure for burrs of this kind is to correct the wheel face form. If the wheel face is exactly square with the sides of the wheel, all points on the face of the wheel will break through the bottom of the cut at the same time and no burr will be formed.

Now a straight, square wheel face like this is an ideal condition that would be difficult to maintain. A much more practical solution, and one which will allow for some variation in machine conditions and wheel grading, is to maintain a shallow inverted V shape on the face of the wheel. This is just as effective in producing a burr-free cut as the square face. Too deep an inverted V in the wheel face is not only an indication that the wheel is softer than necessary and thus wasteful, but when a very deep V exists, one side of the V may break off, leaving the undesirable chisel-shaped wheel face.

Looking again at Fig. 4, it will be seen that the narrower the wheel the smaller the burr. Not only does the thinner wheel produce a smaller burr even with a rounded face, but less heat is generated in making the cut, and the burr is apt to be cut off by the wheel.

While on the subject of wheel thickness, it would be well to point out that the thinnest wheel available which can be practically applied should be used in all cut-off operations. Rubber wheels can be purchased as thin as 0.005 in., but their diameter is limited to 4½ in. It is entirely practical to cut off small rolled or extruded thin wall sections with a burr-free cut using a very thin wheel. Many difficult jobs of this type have been solved by using a 0.015 in. thick rubber wheel 6 in. in diameter.

Another control available to those responsible for burr-free cut-off operations is abrasive-grit size. The finer-grit wheels have better corner-holding ability than coarser grits, and good, sharp wheel corners will produce a minimum of burr. In order to maintain the same effective wheel hardness while going to a finer grit size, it probably will be necessary to use a wheel one or two grades harder. This, incidentally, is an excellent way to gain small changes in wheel hardness when attempting to obtain a shallow inverted V in the wheel face. Going to one grit size finer would give a wheel hardness change less than a wheel in the same grit, one grade softer.

Another control over the amount of burr formed on materials of different kinds is the type of abrasive used. Aluminum-oxide grain is generally used on steel and most other materials that are cut wet. Silicon carbide would be first

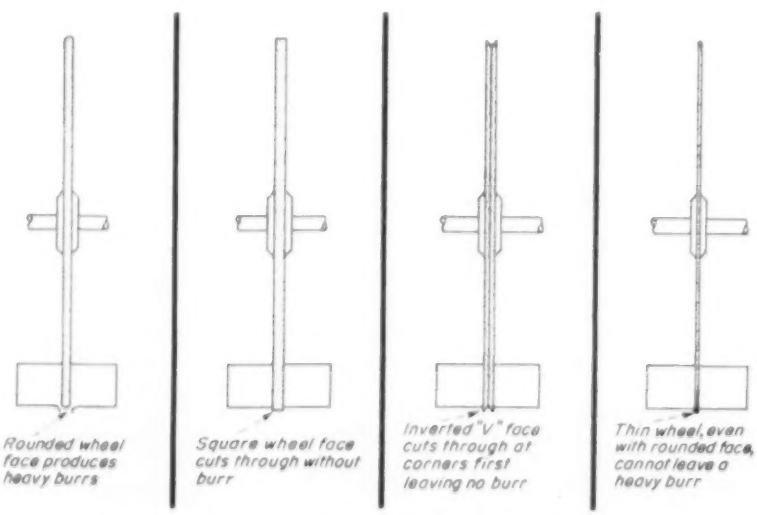

Rounded wheel face produces heavy burrs
Square wheel face cuts through without burr
Inverted "V" face cuts through at corners first leaving no burr
Thin wheel, even with rounded face, cannot leave a heavy burr

FIG. 4 . . Effect of wheel face and thickness on type of burr produced

actual cutting zone to eliminate hot sparks.

choice for non-metallics, and can be used to obtain a softer action on some metals.

Rubber-bonded cut-off wheels are also available in rough or smooth sides. A smooth-sided wheel has better corner-holding ability than a rough-sided wheel, and can be used successfully to make burr-free cuts, provided the work is securely clamped to prevent any pinching of the wheel in the cut. If very good clamping is not available, or excessive heat generation tends to close in the slot on the wheel, a rough-sided wheel, capable of doing some side cutting, would be a better choice.

3 . . BURNING THE WORK

Burn spots on the cut face are a source of concern if subsequent machining operations, other than grinding, must be performed on this surface. Even the low-carbon steels may be hardened sufficiently to make such operations as center-drilling difficult. The higher carbon steels will harden even more. Actually, all the conditions for heat treating are present if sufficient heat is generated, followed by immediate quenching in the flood of coolant.

The cause of burn on the work can be determined by observing the degree of burn as to its color and percentage of the total surface affected. The condition of the wheel face also tells some of the story.

A deep blue burn covering 75% of the area of the cut surface, accompanied by a rounded wheel face when coolant conditions are good, indicates a wheel too hard for the job. Many times a pinching action, caused by poor clamping of the work, will cause excessive side cutting, which creates a great deal of heat and burns the work. When this occurs, it is usually accompanied by stalling (or near stalling) of the motor. Pinching on the wheel will cause much greater overloading of the drive motor than a wheel that is too hard. This fact makes it possible to distinguish one cause of burning from the other.

A commonly observed burn condition is a small (possibly 5% of the total area) burn at the bottom of the cut. As the wheel nears the bottom of the cut, the remaining area of solid metal, through which the heat of the cut can be conducted back into the main body of the work, is small, and localized heating takes place. This can be eliminated by using a softer wheel or providing better cooling.

Another burn condition which can be recognized by its location is one where a relatively small burn area appears almost in the center of the work—the rest of the area is free from burn. This indicates a wheel that is just a little too hard for the job. It cuts freely until the arc of contact becomes greatest at the center of the work. Its inability to cut freely at this point causes the pressure to build up.

The excess heat, plus the rapidly building up pressure, finally becomes so great as to cause burning, then a rapid and sudden breakdown of the wheel face, some times called shelling out. After this breakdown of the wheel face, the wheel cuts freely again and the second half of the cut is completed without further burn. The remedy is a softer wheel.

It is true that burn can often be reduced or eliminated by reducing the time required to cut through the work. The shorter the time for the cut, consistent with the power of the machine and the size of the work, the greater the freedom from burn.

As was pointed out earlier, the volume and temperature of the coolant pumped over the cutting zone have a strong influence on the freedom from burn. If a refrigeration system does not seem practical for your installation, the next best arrangement is to provide as large a coolant sump on the machine as possible.

4 . . STEP CUT

A frequent cut-off fault is a step cut or a small area at the bottom of a cut (usually on the side away from the piece being cut off) which is higher than the surrounding area. Fig. 5 shows how this condition is caused. The right-hand clamp, as it contacted the work, had a strain set up in it that caused a horizontal force component to

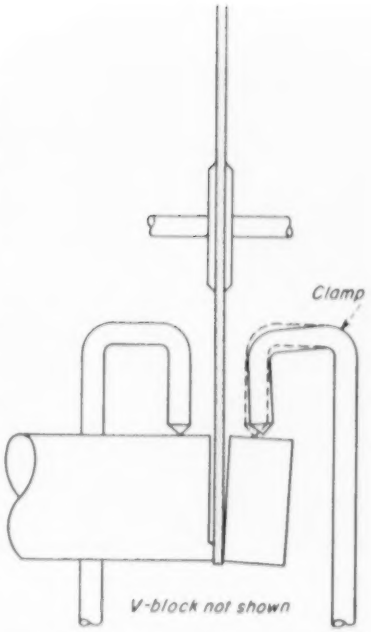


FIG. 5 . . Step cut is caused by a clamp pulling away from cut. Dotted lines show original position of clamp

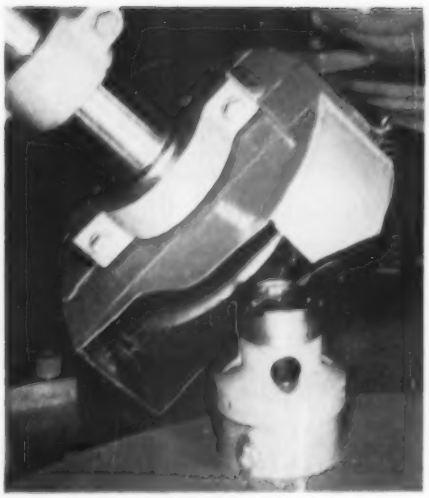
the right. This tendency is overcome by the left-hand clamp and the fact that the work is a solid bar between the clamps. Now as the wheel cuts through the bar it weakens the bar, and just before the wheel cuts through, the right hand clamp is able to pull the piece being cut off to the right, thus opening up the slot and allowing the wheel to move just a bit to the right.

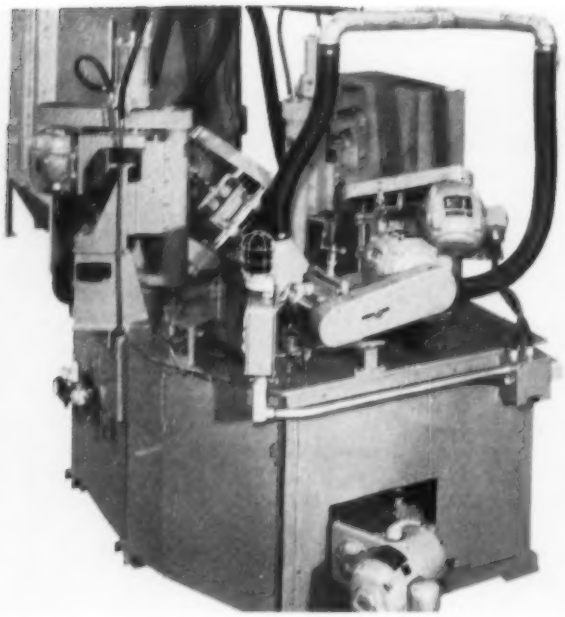
This condition can also be caused by badly worn outboard V-block liner or the outboard work-clamp bearing outside the outboard V-block liner.

The remedy for this condition is proper maintenance of V-block liner and more rigid work clamps. It is gratifying to note that some of the recently designed cut-off machines have much more rigid work-clamping mechanisms.

5 . . CHAMFER AT TOP

A chamfer at the top of the piece cut off is caused by the outboard work clamp exerting a force inward toward the wheel. Just before the cut is completed, a relatively thin work piece is forced back into the wheel at the top and held there until the wheel is withdrawn and the work clamps released.





AUTOMATIC DEBURRING MACHINE processes 200 parts per hr as part of highly automated line producing automotive clutch parts. Fullanchor brushes are 8-in. dia and rotate at 3000 rpm, each driven by a 1-hp motor. Brush penetration (chip) is 0.060 in. Timed to an exact cycle, each brush is selected and positioned to remove a specific burr without damaging the surrounding area. Hoods, above the brushes, are connected to a vacuum system to carry off dry chips

A new look at brushes for

Power brushing has, for many years, been a common metalworking operation for cleaning and finishing. More recently, however, it has found further value as a metal-*cutting* technique, actually removing chips. Brushes can also do a number of sealing and feeding jobs. Furthermore, brushes lend themselves to automatic setups. Here is a roundup of recent practical applications which may ease your problems.

Never take for granted that power brushes, or brushes in general, are limited to the operations you are used to seeing them perform. Currently machines are in use for automatic deburring which use 3 to 5 hp per brush. With correct design and properly selected materials, the brush actually provides thousands of cutting "teeth" to remove material at a high rate.

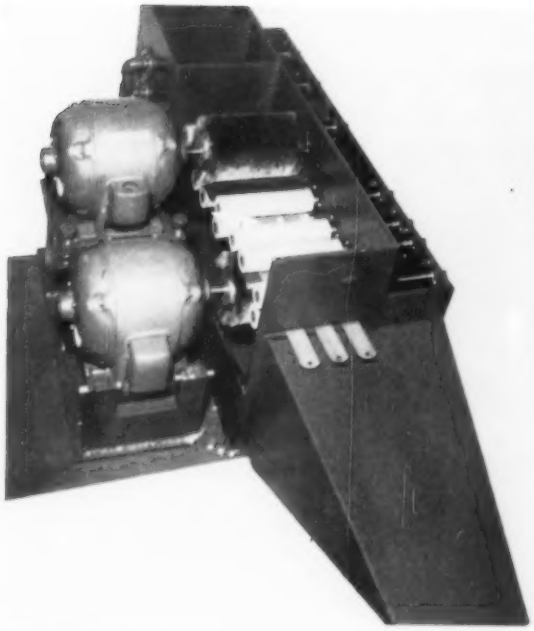
One of the pioneers in the field of power brushing, The Fuller Brush Company of Hartford, Conn (which is celebrating its 50th anniversary this year), operates an Application Laboratory devoted to solving these problems for Industry. When this company entered the industrial field in 1921, the few brushes used in industry were either twisted-in-wire, or tufted, and set in wood backs.

These early designs had limited application, and wooden-backed brushes were impractical because the material, the "fill," fell out. Holders cracked after wet operations or broke when placed under load.

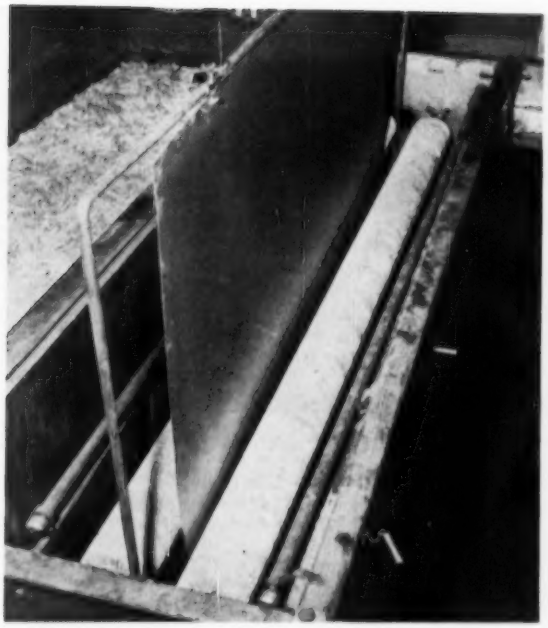
Then, in 1925, this company made an important step forward in brushmaking with the Fuller-gript-design brush construction. It consists of a heavy-gage metal backing formed into a channel to receive the brush material, which is locked in place by a strong, durable, steel wire that runs the entire length of the strip.

This strip may be cut to specified lengths and mounted, with screws, longitudinally or in a helix to a shaft or holder. The strip may be closely wound around and welded to a steel core. Similiarly, this strip is adaptable to many different designs. It can be formed into disks, cups, pretzels, or other irregular shapes. Strips of this design were first successfully used in power brushes in 1937.

Fullanchor, another design which made it possible to increase maxi-



LOOSE SCALE AND SLUDGE are removed from heat-treated hacksaw blades, both sides simultaneously, by two wound-strip brushes. Scale is loosened by pickling, then blades are passed into a brushing station where they are covered with hot detergent and rust inhibitor. Brushes scrub top and bottom surfaces to remove scale and sludge but leave a film of rust inhibitor. Fill is phosphor-bronze wire. Blades are fed at 40 sfpm in a continuous automatic process



REMOVING SAND, SCUM, AND OLD INK from regrained, old, lithograph plates, which are less than ½ in. thick, requires close-tolerance brushing. After regraining the plates with abrasive, they are rubbed with a very fine finishing sand and then sent through a washer where roll-wound-strip brushes, filled with synthetic fiber, remove the scum and sand without marring the regrained surface

metalworking

WILLIAM M. STOCKER, JR., associate editor

mum wheel speeds, insure balance, and add the extra safety that would permit higher horsepower to the brush, was introduced in 1950. This brush is made by driving a heavy-wire staple through a steel channel to individually anchor each tuft of fill so the material cannot shift, loosen, or pull out. These brushes are especially useful for removing burrs from machined parts, for cleaning parts of dirt and oxidation, and for removing rust and corrosion from steel, brass, aluminum, copper, and other metals.

These two basic brush designs are used in most of the power-brushing equipment provided by Fuller's Machine Division, which was formed in 1940 to design and manufacture machines to utilize powered brushes to solve a wide range of industrial problems. In addition to brushing operations, brushes have also been successfully used in sealing aircraft canopies, as splash guards, as static eliminators, as feeding devices in conveyor systems, and as pressure pads for holding delicate parts while gluing. Brushes have been used to solve some otherwise very difficult design and manufacturing problems by ingenious application of their inherent qualities.

Power-driven brushes vary in size from ⅜-in.-dia styles for jewelry, dental, and similar delicate work to more than 30-in. dia. Depending upon the application, brushes may drag slightly on the work or revolve at high speed with the cutting force of a saw. They may be attached to stationary machines, included in the setup of a machine tool as an attachment, or used with hand-held, portable power tools.

Brushes may be constructed singly or in multiples. One of the inherent advantages is that the fill can be selected to fulfill a desired result. Wire, fiber, hair, bristles, synthetics, and mixtures thereof, are used to meet these various needs. And each of these materials is available in a wide range of hardness, temper, corrosion resistance, strength, heat resistance, and other characteristics. Correct selection of fill is essential.

In the various applications described, it must be remembered that brushes, and the machines with which they are used, are *tools*. As tools, they should not be used haphazardly. When setting up a job it is necessary to specify the proper brush material, feed, speed, penetration (depth of cut), and brush position relative to the work. For efficiency, this information is no less important than for a milling cutter or a grinding wheel.

In complex processes it is advisable to have expert guidance and to base the operational specifications on thorough test results. Help and advice are available from such sources as Fuller's Application Laboratory, where testing is constantly in progress.

One problem was to remove the

A new look at brushes for metalworking . . .

BRUSH STRIP is mounted on the guard surrounding the grinding wheel on a vertical surface grinder. Brush protects operator from spray and at the same time cleans the work of grit. Vegetable fiber fill is dense enough to confine the coolant, yet the filaments flex to conform to the contours of the work as it passes under the guard

excess graphite and shellac compound called "dag" from printed electronic-circuit panels. To avoid breaking contact, the copper-plated circuit cannot be disturbed. Also, a dependable production rate is desirable.

The panels are fastened to a conveyor, coated with an abrasive slurry, and fed under a rotating, spiral-strip, brush. It was found that the differential between the speed of brush rotation and the rate of work feed provided the answer to successful performance.

To remove excess paint from the raised-lettered surface of name-plate panels without scratching the paint on the background surface, the plates are pre-soaked in mineral spirits to loosen the paint, then are fastened to a conveyor. Additional mineral spirits is flushed on the panels which are then fed under rotating spiral-strip brushes at 10 sfpm.

The sheetmetal cover for a wall radiator required deburring after sawing. The formed piece was being deburred by hand filing. Fulanchor brushes filled with steel wire were mounted on powered spindles. Material is moved across the brush face once or twice depending upon the size of the burr. The broken edge is cleaner and of better appearance than originally.

On the sawed ends of aluminum tubes, it was necessary to remove burrs and produce a radius. Tubes are carried on a conveyor between locating pins. They pass under a retainer, or hold-down, foot which forces the tubes to rotate past the face of the brush. Wire-filled wheel brushes are mounted on revolving spindles. Small-diameter tubes are successfully deburred and radius is cut at up to 80 pc per minute.

To eliminate static or sparking in a stainless-steel electrolytic bath, strip-style brushes are filled with beryllium-copper wire which acts as a flexible, yet positive, anode contact to carry off excess charges — hence prevent pitting of the metal and the danger of fire.

For pressure welding aluminum plates, it is necessary to abrade the mating surfaces. After the plates have been thoroughly cleaned by a metal-sheet scrubber, they are passed through a scratch-brushing machine where the top surface is abraded by a spiral-strip brush filled with oil-tempered-steel wire. The plate is carried on a belt-conveyor under the brushes and leaves the machine, with the proper satin finish for bonding, clean and dust free. Feed rate is variable from 10 to 60 sfpm.

Manufacturers of fire extinguishers sought a new method, other than buffing, to produce an attractive lustre finish on the exterior that would "shed" fingerprints and other smudges, thus reduce maintenance.

It was found that brushing could be used to provide an attractive scratch-finished surface that did not show fingerprints and required very little polishing. This is a new finishing idea, useful in many other metal products such as furniture and appliances. Both types of brushes are used and the revolving extinguisher is introduced to the revolving brushes, the speed varied to suit the hardness of the material being brushed and the desired finish.

Brush-strip guards and sealers have been most effective in many diverse applications. Synthetic brush strips with aluminum backing are used by the aircraft industry to seal air from cockpit and bombbay doors. Similar strips are placed around delicate instrument panels to keep dirt and other foreign matter from penetrating the mechanisms. Intermeshed brushes give good sealing plus flexibility.

Fuller Brush also uses its own brush strips under turntables and "merry-go-round" devices to keep shavings, chips, and dirt from clogging the automatic machinery which it designs and manufactures.

BRAKES AND FEEDERS

From the butter-and-egg business comes an idea that manufacturers might find useful. Rotating spiral-strip brushes provide a continuous conveyor to carry eggs to a central collection point. The soft fibers move the eggs along without damage. Perhaps the same idea would work in handling vacuum tubes and other delicate devices. And it isn't limited to very light objects.

Similarly, brushes can be used to provide controllable "drag," as a brake or friction source. For example, parts ejected from a machine tool at high speed can be passed, or dropped, through a brush-lined area to slow them down before they reach the tote box. Or, brushes can control the speed of cartons conveyed to a storage area.

Still another application is orientation for automatic feeding. Brushes will provide sufficient resistance to turn or remove an incorrectly positioned piece, while their flexibility will minimize jamming or damage to the work. By adding beryllium copper to the brush fill, it is even possible to utilize electrical characteristics for sorting or positioning, or counting.

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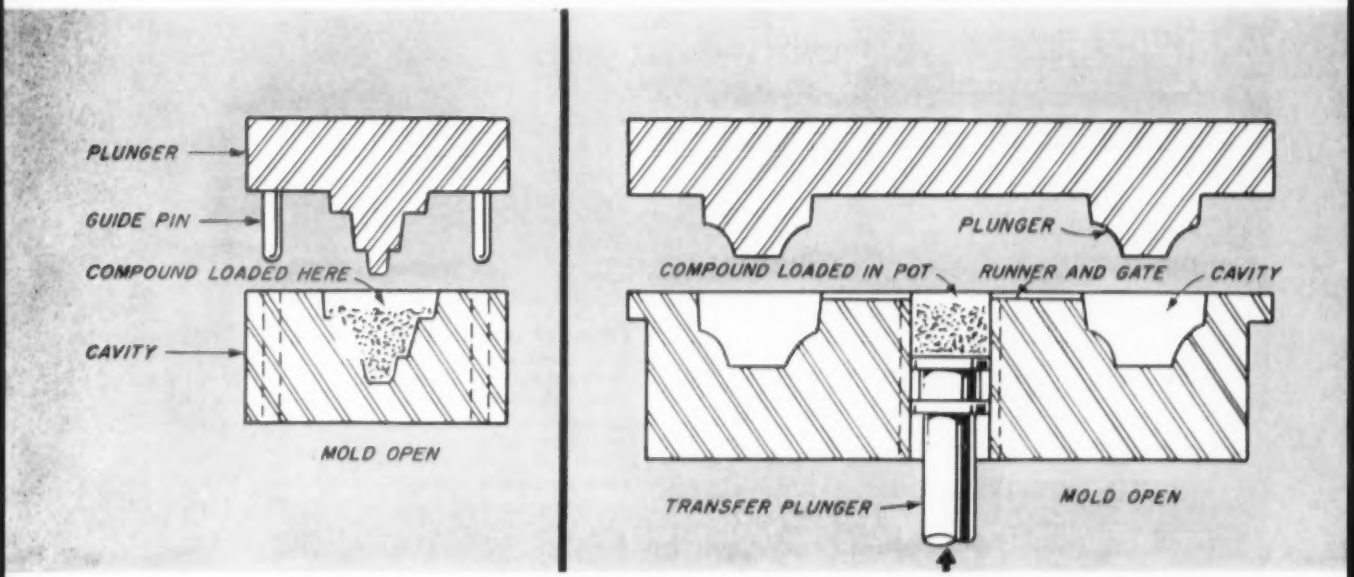
Advanced tool designing for . . .



Compression and transfer molds

JOHN W WRIGHT, associate editor, American Machinist

EDWARD W CALLAHAN, supervisor product engineering, GENERAL ELECTRIC CO, TAUNTON, MASS

Recent engineering advances in compression and transfer equipment as well as the development of improved materials (phenolics) have vastly contributed to the increased production rate of molding thermosetting plastics. Compounds have been improved for a shorter cure and tailored for a specific job or application. New materials such as polyesters and glass fiber fillers have created new applications because of their increased impact strengh. Completely automatic compression-molding machines are in operation today, as well as improved designs of dielectric preheating equipment. Projected prototypes of the future coupled with the latest mold designs, tooling, and auxiliary press equipment illustrated in this report, exemplify the growing volume of applications for thermosetting plastics in the industrial field.

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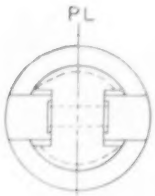
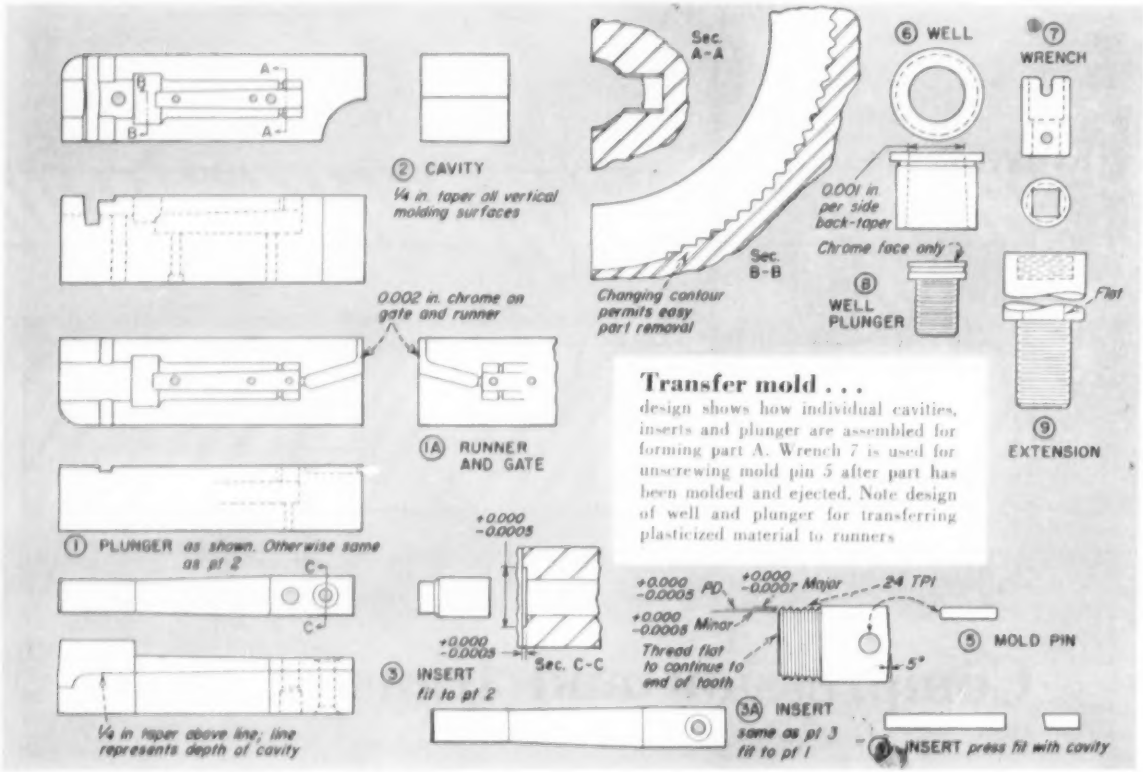
Three methods of molding make this assembly . . .



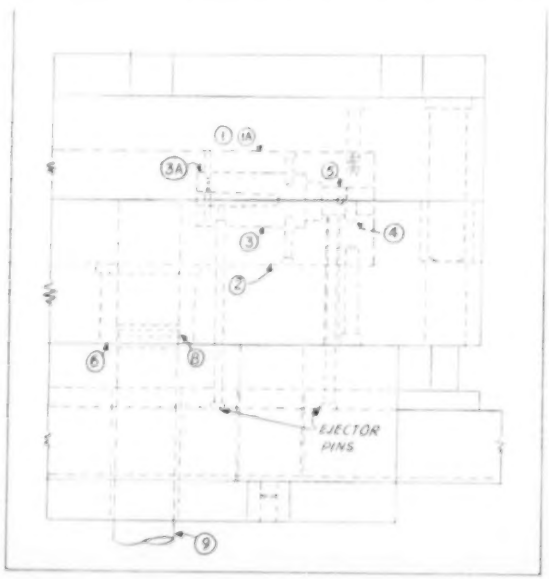
Indicating lamp . . .
has three parts, a support *A* made by transfer molding, an escutcheon *B* with a male and female thread made by compression molding, and a tinted transparent cap *C* made by injection molding

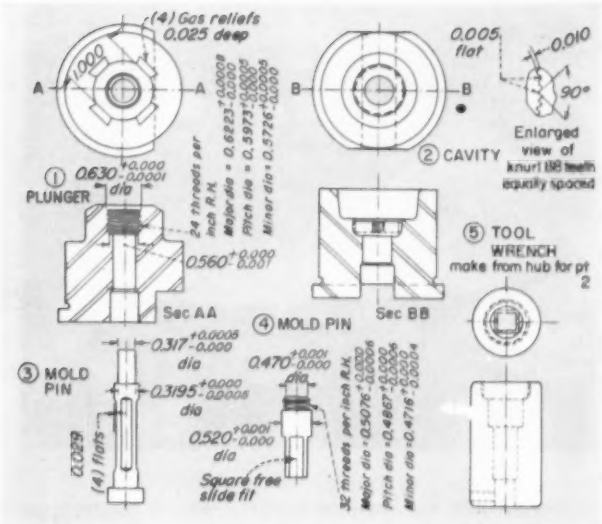

Sec. A-A
⑥ WELL
⑦ WRENCH
② CAVITY
¼ in. taper all vertical molding surfaces
0.001 in. per side back-taper
Chrome face only
Sec. B-B
Changing contour permits easy part removal
⑧ WELL PLUNGER
Flat
⑨ EXTENSION
0.002 in. chrome on gate and runner
1A RUNNER AND GATE
① PLUNGER as shown. Otherwise same as pt 2
+0.000 -0.0005
+0.000 -0.0005 PD
+0.000 -0.0007 Major
24 TPI
+0.000 -0.0005 Minor
Thread flat to continue to end of tooth
5° ⑤ MOLD PIN
+0.000 -0.0005
Sec. C-C
③ INSERT fit to pt 2
3A INSERT same as pt 3 fit to pt 1
④ INSERT press fit with cavity
¼ in taper above line; line represents depth of cavity

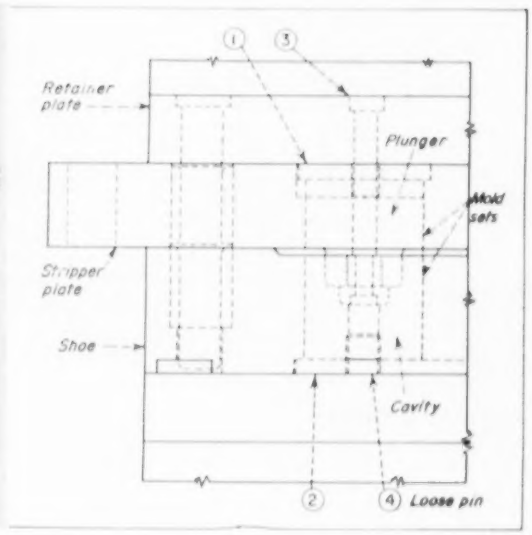
Transfer mold . . .
design shows how individual cavities, inserts and plunger are assembled for forming part A. Wrench 7 is used for unscrewing mold pin 5 after part has been molded and ejected. Note design of well and plunger for transferring plasticized material to runners

What is transfer molding?

Transfer molds are used exclusively for thermosetting plastics, however differ from compression molds in that they contain a built-in pot and plunger. As the mold is closed, molding compound contained in the pot is heated and compressed to a plastic state. At this point the material is transferred through the sprue, runners, and gate into the mold cavity. Mold remains closed under continued heat and pressure until cure is complete. Preforms loaded into the pot chamber are often preheated to achieve a shorter molding cycle. Closer tolerance across the PL can be maintained in transfer molding because the mold is clamped prior to transfer of material.



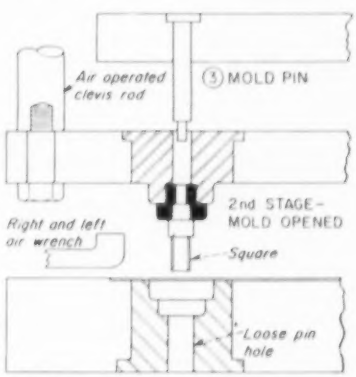




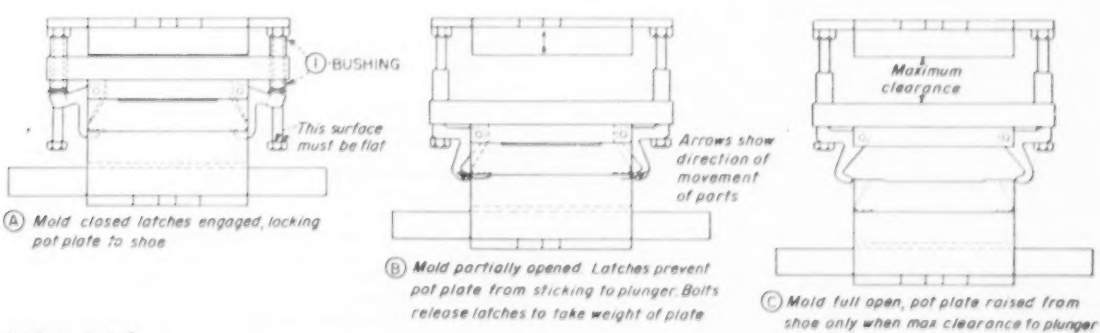
Design of four-cavity compression mold . . . shows how plunger, cavity, and mold pins are assembled to form part B. Knurl in cavity 2 and in wrench 5 was hubbed. Wrench, air-operated, meshes with knurled head on cap and is used for unscrewing part from male thread in plunger *1* when mold opens. Simultaneously sufficient travel is provided in the stripper plate for clearing pin *4* from mold, and unscrewing mold pin from female thread with wrench *5*. Preforms are used to mold cap

What is compression molding?

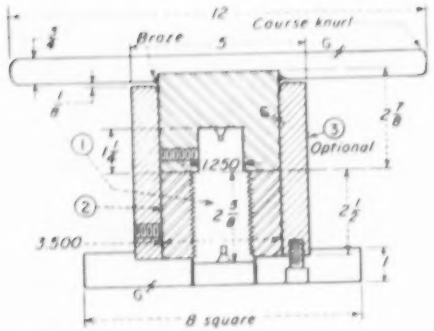
Compression molds are extensively used for thermosetting plastics (heat hardens) and comprise a cavity for holding the compound or preform, and a plunger for compressing the material along with the application of heat, to plasticize the compound as the mold closes. Mold remains closed until cure is complete. Mold temperatures range from 290 to 350 F depending on type of material being molded. Compression molding is normally limited to non-intricate parts. When a part calls for the use of fragile inserts or core pins, thin walls or close tolerances across the PL, compression molding is · t normally advisable. Prime reason for this drawback is attributed to the excessive wear and pin breakage stemming from the high pressure and abrasive action of the compound as the mold closes. Parts of this intricate nature may be transfer molded.



Mold opened . . . showing method of simultaneously removing part B from plunger and core pin for female thread. Note mold pin *3* is free from loose retainer plate to prevent binding in molded part as it is unscrewed from plunger


① BUSHING
This surface must be flat
Arrows show direction of movement of parts
Maximum clearance
Ⓐ Mold closed latches engaged, locking pot plate to shoe
Ⓑ Mold partially opened. Latches prevent pot plate from sticking to plunger. Bolts release latches to take weight of plate
Ⓒ Mold full open, pot plate raised from shoe only when max clearance to plunger is obtained

Safety latch . . . as applied to transfer molds. Safety device is also used on compression molds, when a floating loading shoe is used to save machining time on deep cavities



Master set . . .
of threaded plugs *1* and rings *2*, interchangeable with the fixture, permits chasing threads of all pitches. Base of fixture, when mounted on milling-machine table, is tilted to lead angle of thread. Housing *3* is an optional detail part

Threading fixture . . .
shop designed, is used for chasing threads on mold inserts. This method of thread milling provides an accurate PD, excellent finish on thread, and a means of controlling close-to-shoulder threading. Because of good finish, threads do not require additional hand polishing or bench work. Milling

cutters, when not a standard size, are shop made. Inserts or mold pins requiring threads as small as 3-56 have been cut by this method

Compression vs Transfer Molding . . .

EDITOR'S NOTE—Pros and cons listed for the two types of molding processes are not to be construed as hard and fast rules. These statements were compiled from many sources representative of the plastic industry as a whole. There are always exceptions and deviations

COMPRESSION-MOLDING Advantages:

1 . . Usually mold costs are lower
2 . . Can mold thermosetting and thermoplastic compounds
3 . . Suitable for molding large, bulky parts
4 . . High-production rate on thermosetting parts

Disadvantages:

1 . . Requires deep loading; however, loading shoes help to alleviate this problem and to minimize machining costs
2 . . Cannot mold intricate parts, nor parts requiring side draws, thin-walled sections, or small holes
3 . . Close tolerances cannot be held, particularly across the parting line
4 . . Pin diameter-to-length ratio, unsupported, is 1½:2, supported 3:1
5 . . Molded parts require more handling and finishing costs
6 . . Because mold cannot be clamped tightly, flash of from 0.005 to 0.010 in. results from buildup condition
7 . . Mold life is limited because of high compression forces and abrasive action of molding compounds

TRANSFER-MOLDING Advantages:

1 . . Greater mold life because mold is clamped tightly before plastic material is transferred, thereby eliminating abrasive action
2 . . Finishing costs are frequently lower because of absence of flash at parting line
3 . . Production costs are low
4 . . Intricate shapes, and parts requiring thin walls, delicate pins and inserts, can be molded with relative ease
5 . . Pin diameter-to-length ratio, unsupported, 4:1, and supported, 10:1
6 . . Operating time is faster
7 . . Molding material is in a semi-liquid condition before it is transferred into molding cavities, which are already clamped together at their parting line
8 . . Close tolerances can be held, particularly across the parting line
9 . . Acceptance of new plastic materials and intricate part designs tend to increase the demand for transfer molding over compression molding

TRANSFER-MOLDING Disadvantages:

1 . . Mold costs may be increased
2 . . Compound waste material remains in the loading well after each molding cycle. Because this is thermosetting material, it cannot be reused
3 . . Grinding or sawing operations are required to remove the gates, and if appearance is critical it may be necessary to buff the gate area

Recommendations for mold designing, including gating, water lines, ejector pins, mold steels, and finishing, etc are contained in Special Report 421, May 7 '56, p137. Additional recommendations are listed below.

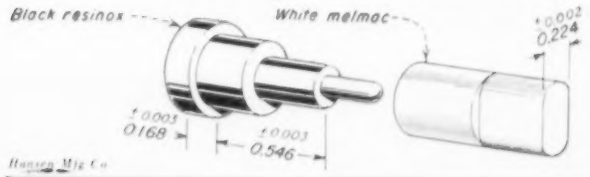
MOLD STEELS

1 . . Boiler plate is used to make the mold frames.
2 . . Primarily for compression molding SAE 3312 is used for machined cavities, while SAE 3110 is used for hubbed cavities. Both steels are pack hardened to Rc 58-60.
3 . . Inserts, particularly if they are long and heavily stressed, and hubs are made from *MYA chrome-silicon alloy steel (C.42, Cr 1.45, Mn.3, Si 1.45, V.25). This steel has been found to be very strong and yet flexible with good wear characteristics. *(Houghton & Richards Inc, Boston)

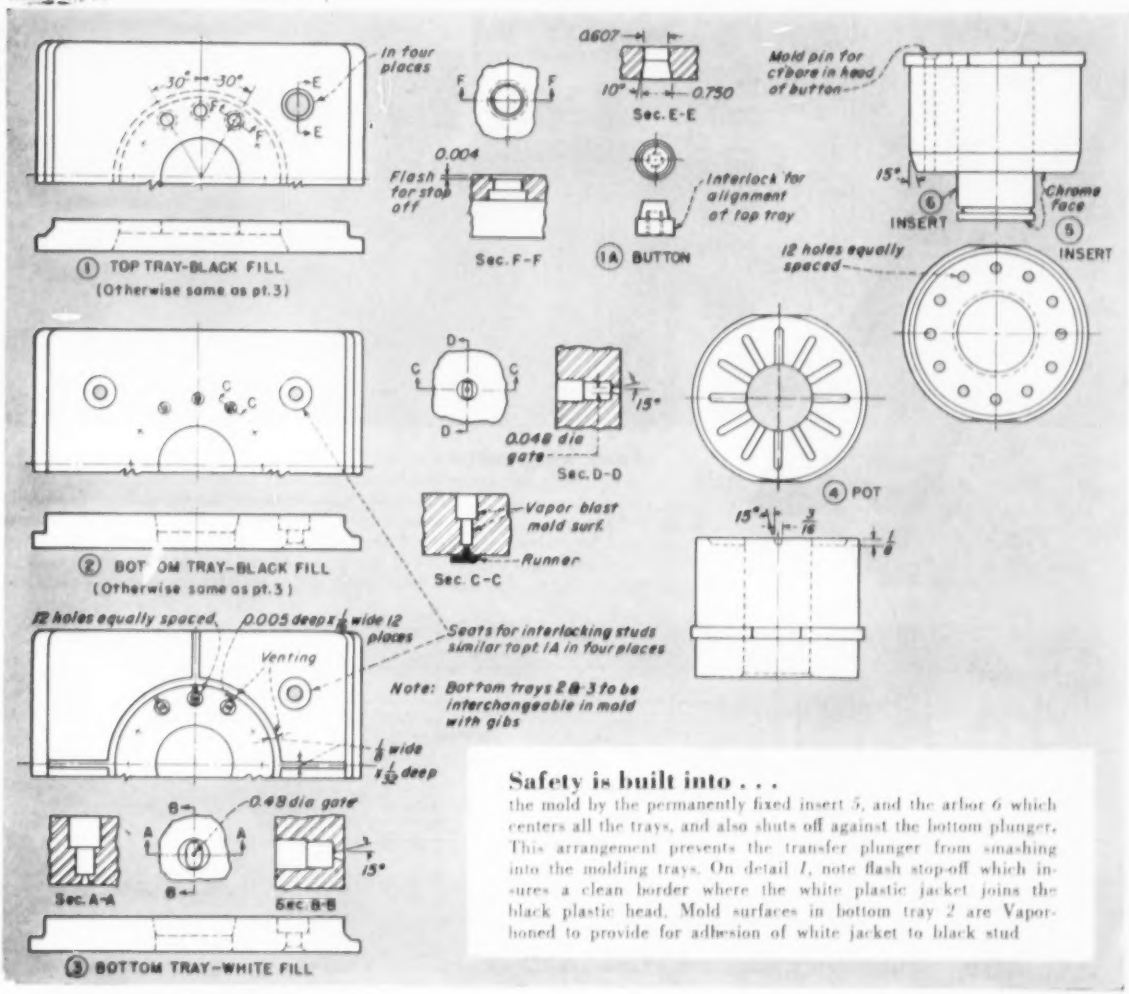
MOLD FINISHING—AFTER FILING

1 . . Start with a 120 stone. Cross-grain with a 240 stone. Final finish with a 600 stone. Plug all holes to maintain sharp corners.
2 . . After hardening, if cavity is burned use a 240 stone, finish with a 600 stone, and follow with a diamond polish. Final step is to clean all cavity surfaces with white Aloxide powder in preparation for chrome plating.
3 . . Chrome-plating cavities 0.0002 to 0.0003 in. thick prolongs mold life considerably. In the immediate area where the runner and gate enter the cavity, the surface of the cavity where the wash comes up the sides is plated 0.003 to 0.005 in. thick. Extra heavy plating in this area reduces mold erosion.
Hubs are used wherever possible for sinking multi-mold cavities. When the cavity profile is intricate a rough and finish hub is used, and sometimes an additional hub for the raised areas on the profile.

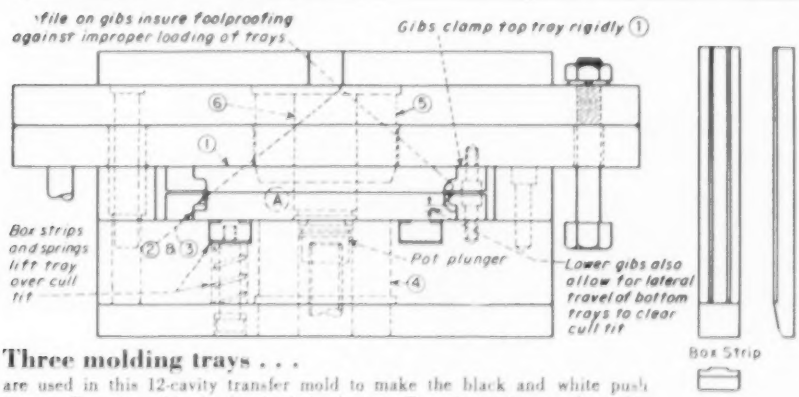
Black & white pushbutton molded in one operation...



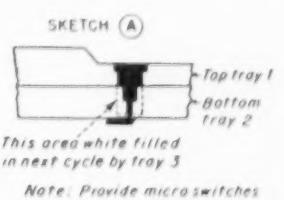
Exploded view of pushbutton . . . design shows the black molded head and the white jacket as two separate parts purely for clarification purposes. In actual production the two parts are molded as an integral unit



Safety is built into . . . the mold by the permanently fixed insert 5, and the arbor 6 which centers all the trays, and also shuts off against the bottom plunger. This arrangement prevents the transfer plunger from smashing into the molding trays. On detail *1*, note flash stop-off which insures a clean border where the white plastic jacket joins the black plastic head. Mold surfaces in bottom tray *2* are Vaporhoned to provide for adhesion of white jacket to black stud

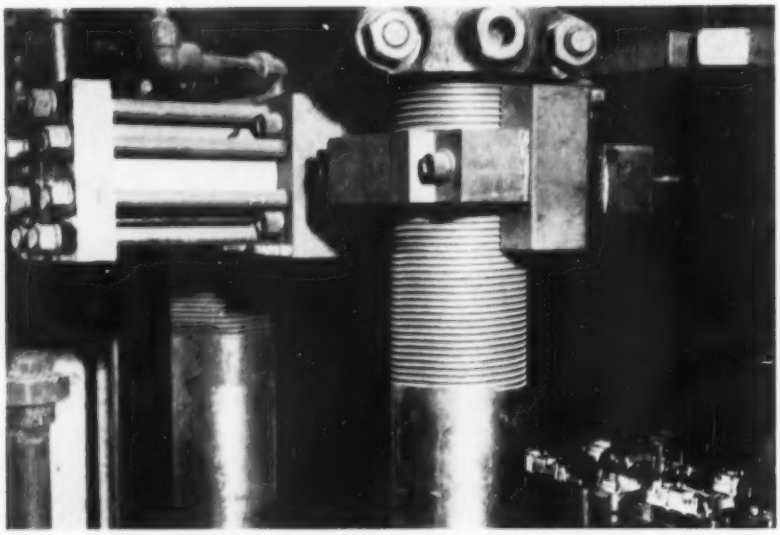

Pile on gibs insure foolproofing against improper loading of trays
Gibs clamp top tray rigidly 1
6
5
1
A
2 B 3
4
Box strips and springs lift tray over cull fit
Pot plunger
Lower gibs also allow for lateral travel of bottom trays to clear cull fit

Three molding trays . . . are used in this 12-cavity transfer mold to make the black and white push button. Tray *1*, molds the head of the button. Tray *2* simultaneously molds the stud, or core, integral with the head of the button (see sketch A). Tray *2* is then replaced by tray *3* which molds the white jacket around the stud

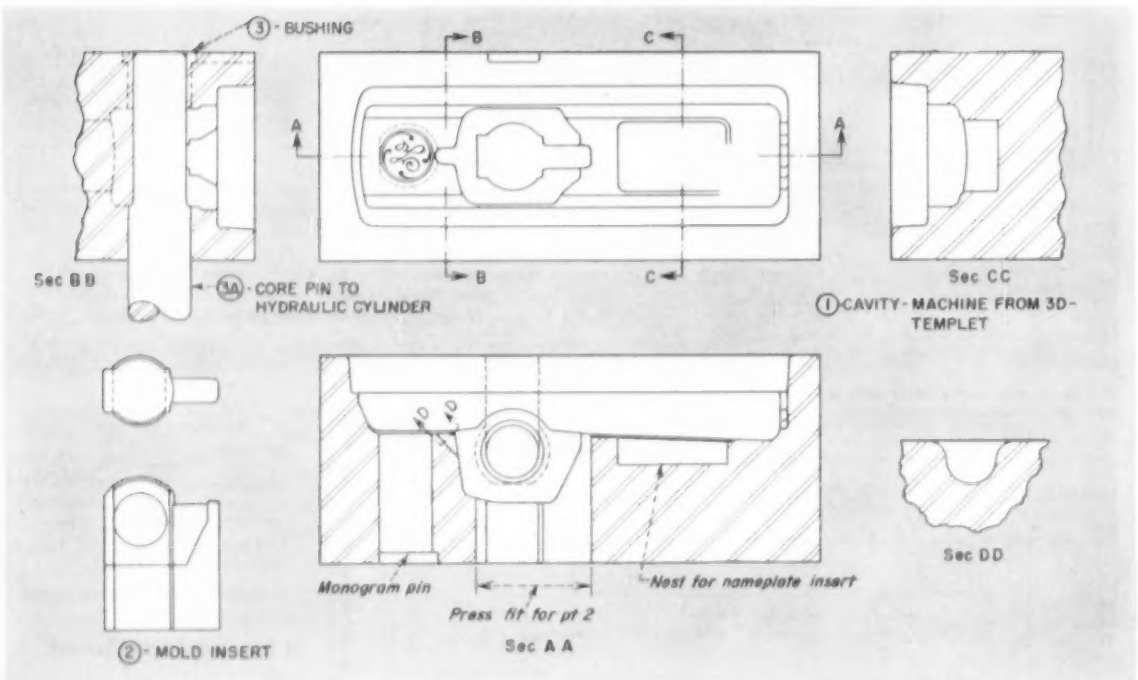


When mold is closed . . . a black preheated pill is loaded into the pot and transferred through runners and gate. After curing cycle, mold is opened, tray *2* removed, and excess plastic blown free from runners, tray, and pot. Tray *3* is loaded into mold and a preheated white pill is transferred from pot to cavity

Outstanding example of compression molding cored

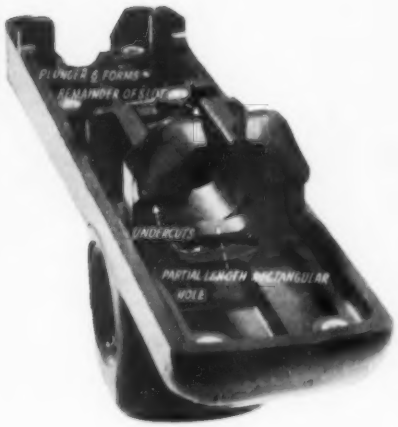


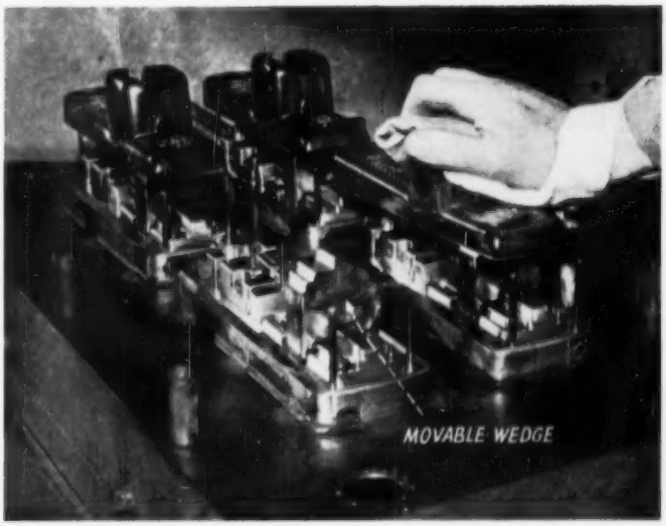
Four long cores . . .
in the cavity half are pulled by two hydraulic cylinders independently mounted on each side of the press posts (one cylinder shown above). Independent cylinder mounts reduce setup time and facilitate mold handling. Preforms are used for molding this part. When mold closes, a Sinclair-Collins timing device takes over entire operation of the press. At the end of the curing cycle, the timing device trips a precision switch which actuates the hydraulic cylinders



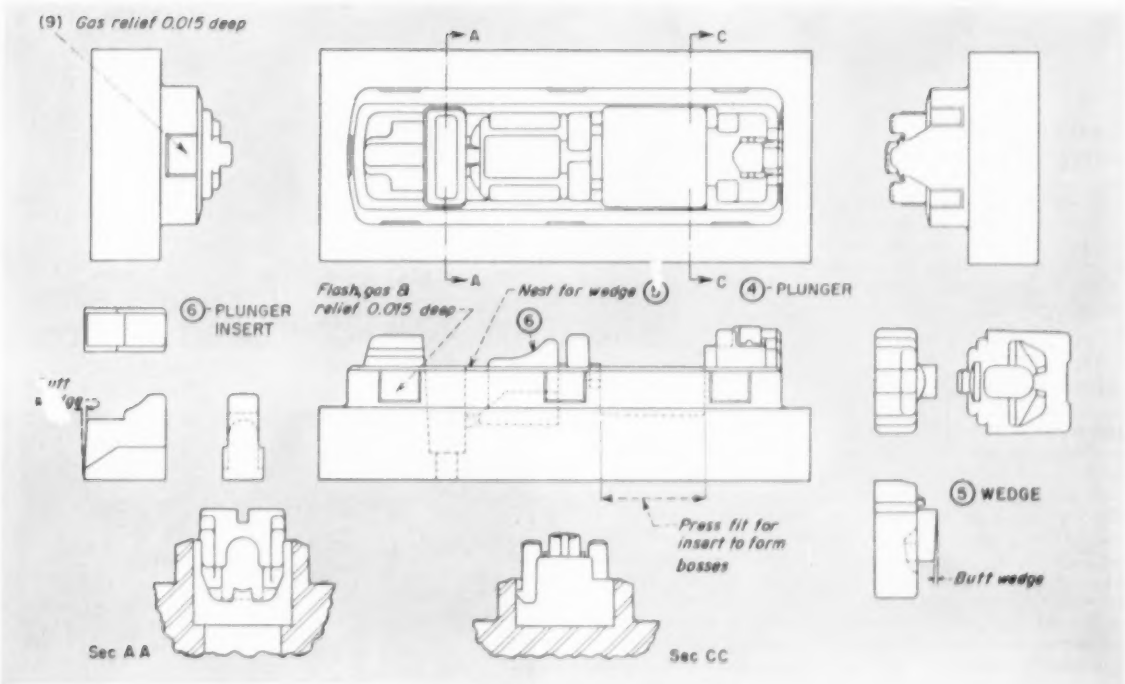
3D templet . . .
was used to machine the cavity half of this compression mold in a Keller duplicator. Mold insert 2 cores out top opening and side slot. Pin 7A (superimposed on Sect BB) is actuated by a hydraulic cylinder to core the side through hole, and is piloted in bushing 3 and insert 2

holes, undercuts, and metal inserts...



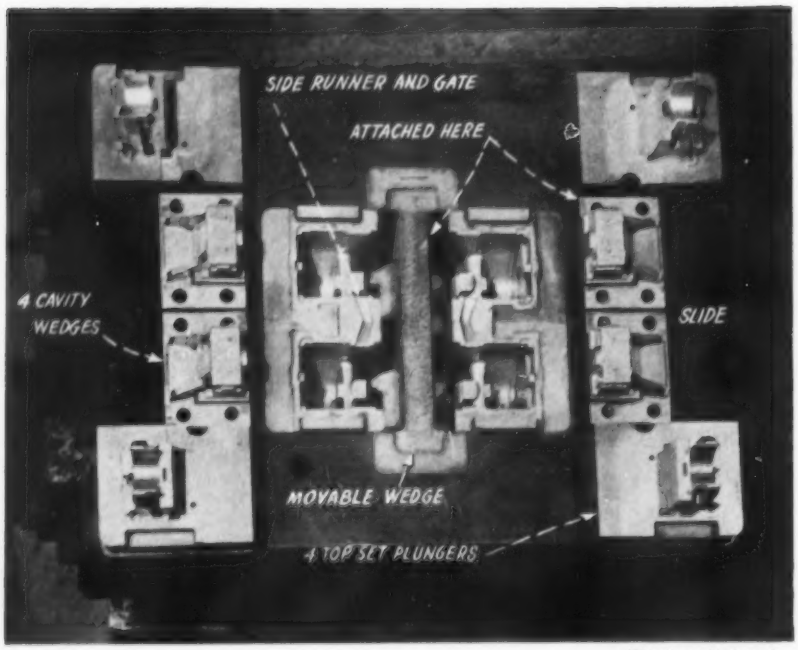


Mold open . . .
shows movable wedge at top of stroke and operator exerting forward pressure to strip undercuts on molded part from wedge. Plunger insert 6 shuts off (metal to metal) against the loose wedge and forms remainder of rectangular slot



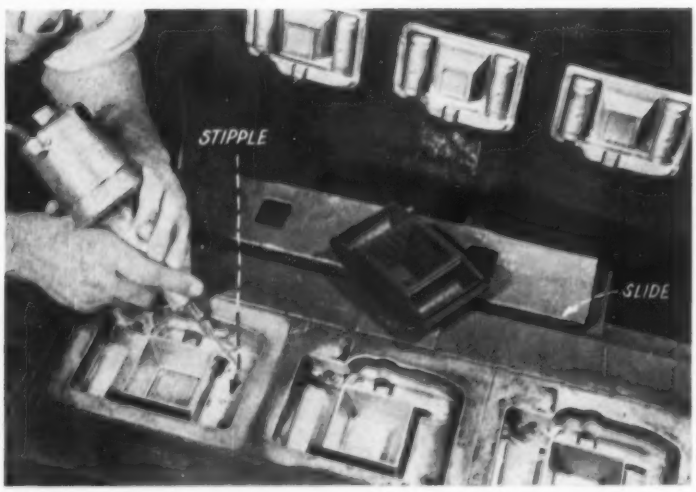
Movable wedge . . .
incorporated into the design of plunger permitted coring of two heavy undercuts and partial length of rectangular hole. Movable wedge is necessary to permit removal of part from mold

Movable mold wedge . . .
lifts four cavity wedges, bolted to its sides, for releasing camera housing at end of molding cycle. Cavity wedges core heavy undercutting and ribbing on flange of housing. Cam-actuated slides pull two cores each. Cores are used to form hole in housing for flash attachment. Also shown in photo are the four top plungers and the side gating to the cavities in this transfer mold



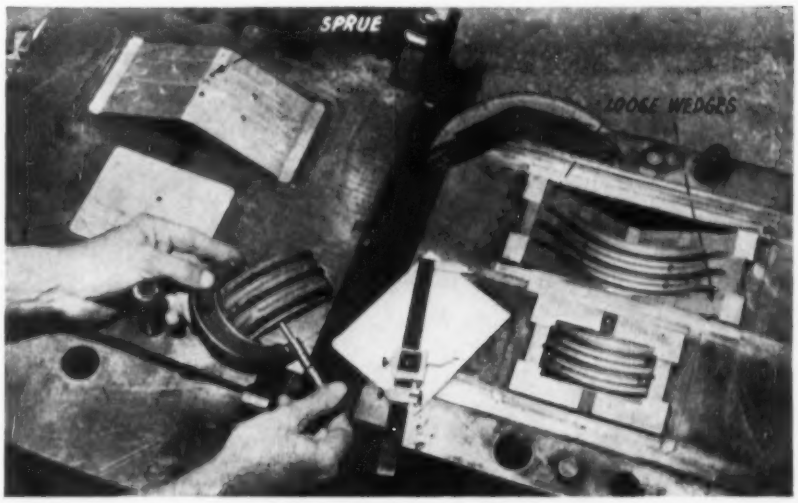
Whitehouse Products Inc

Landed-plunger compression mold
for camera main body. Cavity is in foreground and plunger in background. Note cam-actuated slide, on rear of cavity mold, for pulling three round core pins. When mold is closed, slide is kept in a locked position. Semi-circular contour in cavity has been stippled to simulate leather finish



Atomic-hydrogen . . .
arc welding a mold plunger to fill in a specific area for a customer change calling for a wider slot. Welder is using a self-hardening tool-steel rod of the same heat-treating characteristics as the parent metal. When wire of parent material is not available, bar stock of the parent material can be machined and the chips used for welding operation. After welding, plunger is annealed, new design machined in, and then rehardened. Before welding, chrome plating must be stripped. Repairing broken hubs, worn out gates, chipped molds, and rectifying mistakes of machining, can be salvaged in the same manner. Technique of welding also lends itself well for repairing minute-confined areas such as changing patent pending numbers to new patent numbers. For example, on a list of patent numbers 1/32 in. high, spaced 1/32 in. apart, one series of numbers required changing. Welder filled in obsolete numbers without harming or pitting the adjacent numbers. New numbers were then recut. Atomic-hydrogen welding operates around the clock in this shop and has saved countless hours of machining and downtime (Eureka Welding Equip, Detroit, Mich) (GE hydrogen-arc, welding transformer 6WK 17A)

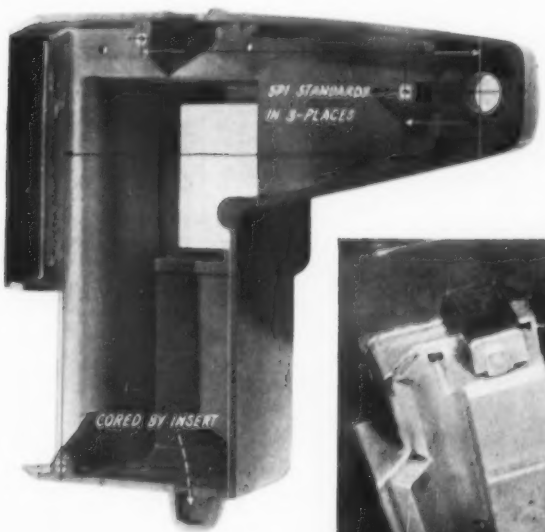
Pot and plunger are self-contained . . . in this transfer mold (integral, pot type, or conventional design). Integral molds are used when part design calls for special gating. In design at right, it was not advisable to gate into the sides or end of the cavity because of the configuration of molded part. Note sprue enters the cavity directly. Another advantage is that finishing costs are cut and upsetting of the metal insert is avoided. Two loose wedges form a deep undercut beneath the outside semi-spherical ribs. When part is ejected, wedges travel at a 5° angle, thus freeing themselves from the undercut. Bridged steel insert is molded into part for additional strength. Spring-loaded bar designed into the mold eases the wedges back into the cavity, rather than to let



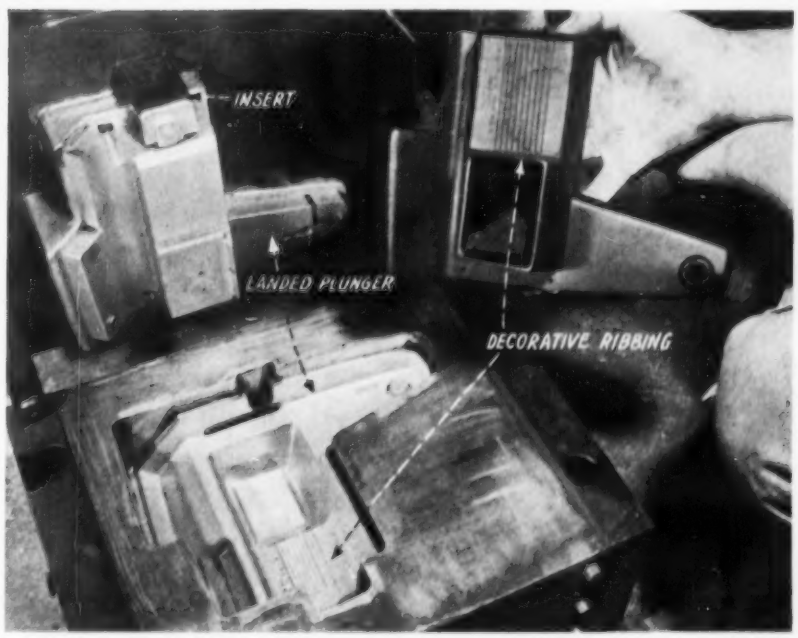
them drop of their own weight, because this could cause enough shock to upset the metal insert. Smaller mold in foreground is similarly designed

Tolerances were held to *SPI standards on center-to-center location between all inserts and large hole on arm of viewer. Wall thickness throughout the entire part was held to ⅛ in. Hairline, normally appearing wherever an insert has been used, was eliminated by machining a very shallow V groove around the seam and filling the groove with an atomic-hydrogen welded bead. If necessary, insert can still be driven out for repairs or replacement

*(Society of Plastics Industry)



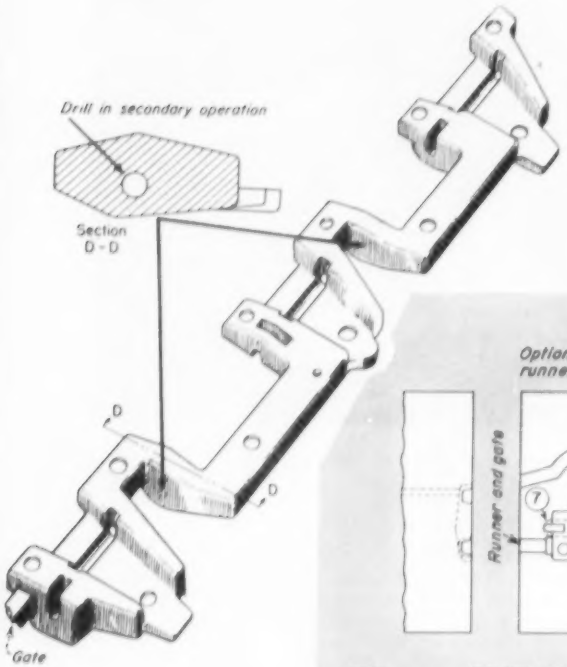
Multi-level cutoff . . . was used on this single-cavity landed-plunger compression mold to produce the housing for editing 8-mm-movie film. Decorative ribbing on 90° adjacent walls of mold were milled in with a 20°-offset spindle. Majority of cavity machining was done from a 3D templet. Master for templet was made from mahogany and included shrinkage allowance. Burke's compound was poured around the master, and steel inserts added to the base and top face of the molding compound. Steel inserts added strength and provided a means of grinding the top face and base parallel, for setup purposes. 3D templets cannot always incorporate the entire



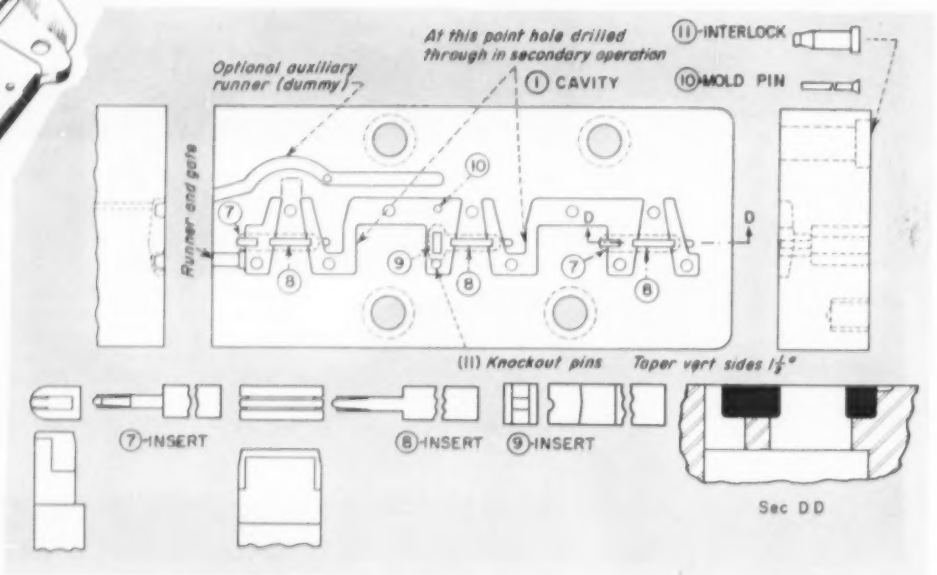
Kuhrt Inc

profile, and when this occurs, secondary operations with a flat templet take care of the additional machining. Another method for multi-cavity molds is to machine one cavity complete, harden it, and then use it as a templet on the duplicating machine. Plunger in photo was machined from the wooden master by compensating on the stylus for wall thickness of molded part

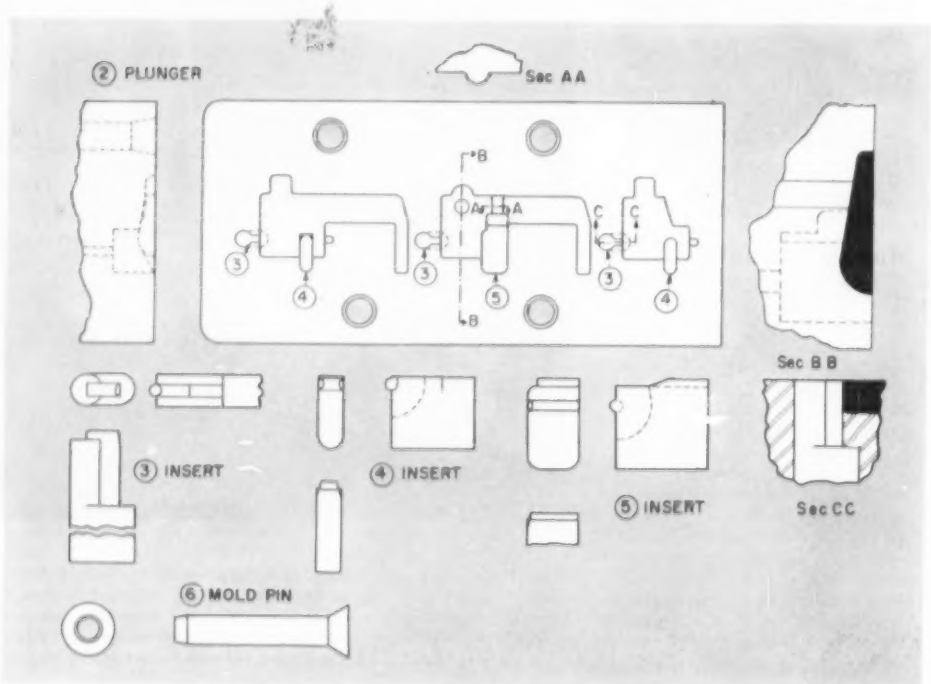
Steel past steel cores long 0.100-in.-dia. hole



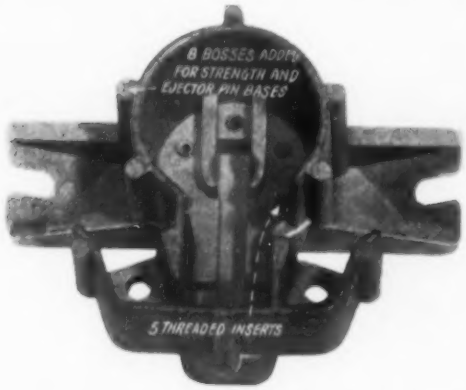
It was impractical . . .
to core the through hole in the two areas indicated by Sect DD, because at these points plastic material fills in both the cavity and the plunger half of the mold

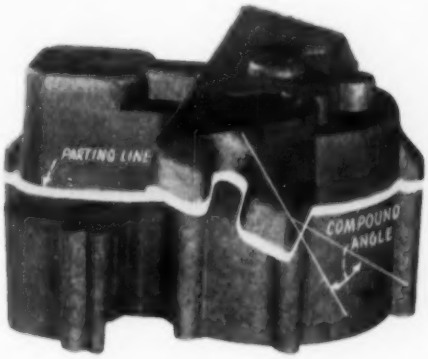


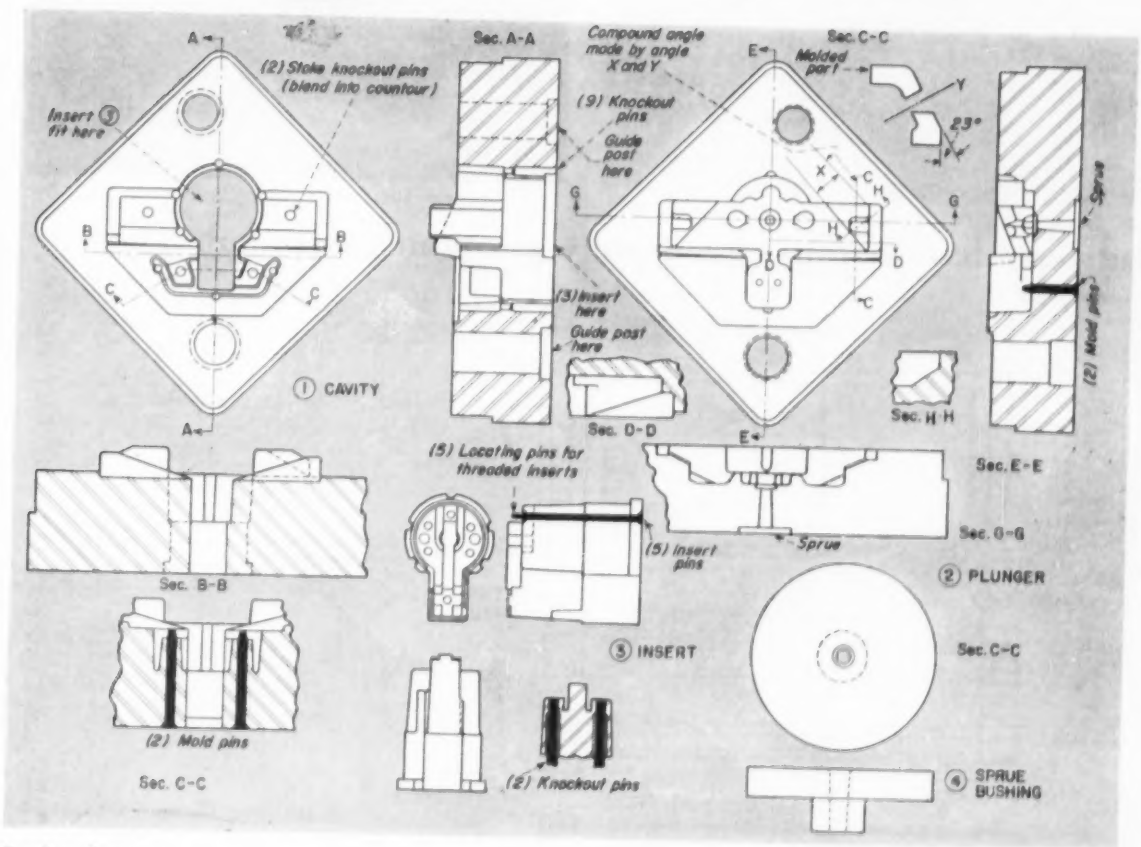
Metal to metal contact . . .
at the parting line of this transfer mold forms a 0.100-in.-dia hole through 95% of the part length. Note the remaining areas where the hole is later drilled through in a drill jig. Completed mold used an offset pot to obtain a uniform balance over the transfer force and thereby accomplish tighter clamping of mold



3D templet machines compound angle at parting line







Socket base . . .

is molded from G-E mycalex in a single-cavity gas-fired transfer mold from preforms heated to 1300 F. Cavity *1* and plunger *2* were machined from a 3D laminated plastic templet for ease of machining compound angle which was used to form a clean cutoff at stepped parting line (See PL in photo). After duplicating operation, moldmaker matched contours between the cavity and plunger at the parting line. Top view of cavity shows eight bosses added to design, with customer approval, for additional strength around thin-walled cylinder and to provide a base for ejector pins. Note that cavity and insert have their own guide posts, because when run in the press they are assembled into standard frames and accessories. All molding surfaces are chrome plated. Note that unlike injection molding the sprue design for transfer molds has the taper reversed to keep sprue attached to cull, rather than to molded part.

What is G-E mycalex?

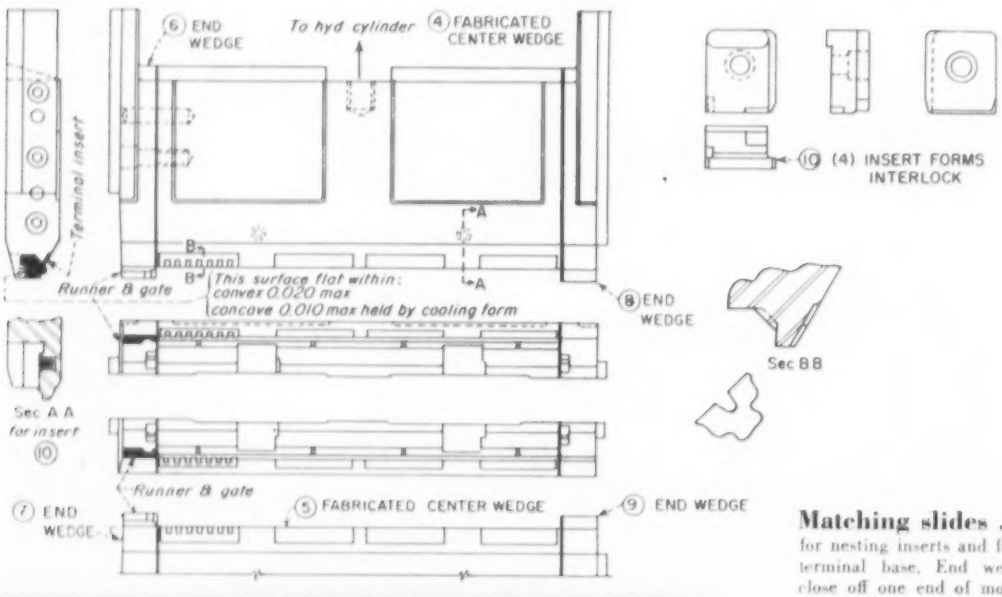
G-E mycalex is a hard, stone-like material composed of glass, and powdered mica. Because of its ability to withstand moisture absorption and higher operating temperatures, (stable up to 650 to 700 F) it is replacing ceramics, melamine, and phenolic materials in many applications. It has electrical characteristics that are superior to previously used materials. For example, G-E mycalex plates, installed in an arrester-gap unit design, have withstood the impact caused by discharge of 100,000 amperes, and still maintained alignment because of dimensional stability of the material over a wide range of electrical and at-

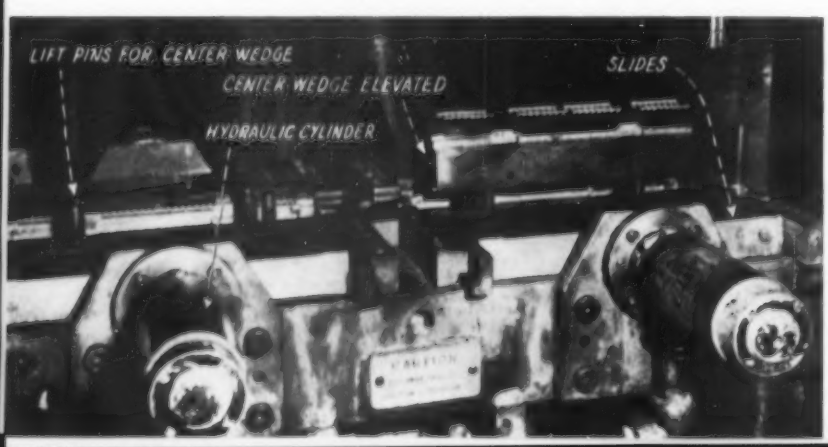
mospheric conditions. This plastic insulating material, **which can be molded to close tolerances, also has a dielectric strength of 400 volts per mil, a dielectric constant of 6.9 for 60 cycles, and 240-sec arc resistance. G-E mycalex may be subjected to all the conventional machining operations, and can be molded with metal inserts, a distinct advantage over ceramic and porcelain refractories. The material has very little mold shrinkage, requiring a draft of 2° on vertical sides of the mold. Under certain conditions, this draft angle can be reduced**

Transfer mold . . .

for G-E mycalex compound is electrically heated and operates at 700 to 800 F. Because of high operating temperatures, selection of steel for the mold presents quite a problem. Past experience showed best steel for this application is S5 hot-work steel (Houghton & Richards). In photo above of another G-E mycalex part, operator is blowing away the cull from pot where preforms are loaded just prior to mold closing. After parts are molded, they are placed in a holding oven for annealing to prevent thermal shock. Annealing cycle is for approximately 8 hr between 300 and 500 F, depending upon size of part. Small, intricate, G-E mycalex parts are transfer molded, from preforms made by an automatic pill machine

Intricate base requires accurately positioned terminals...

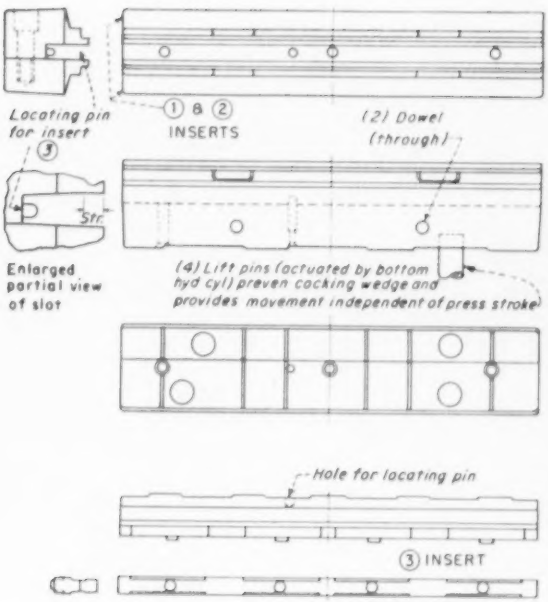


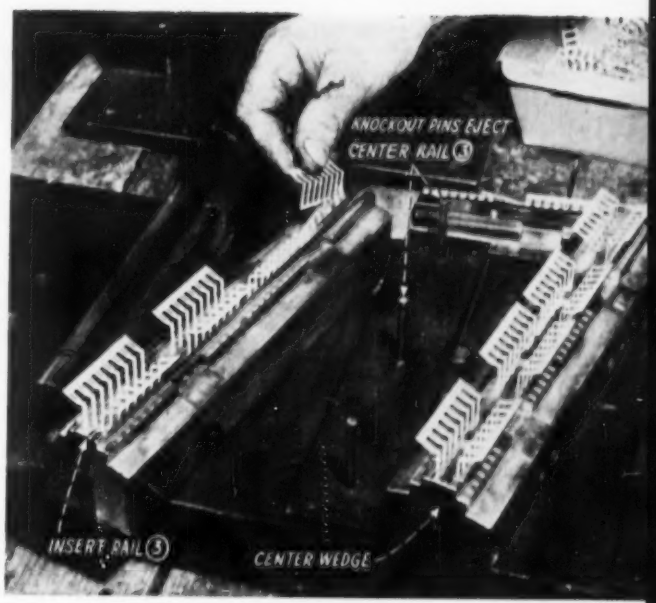


Matching slides . . .

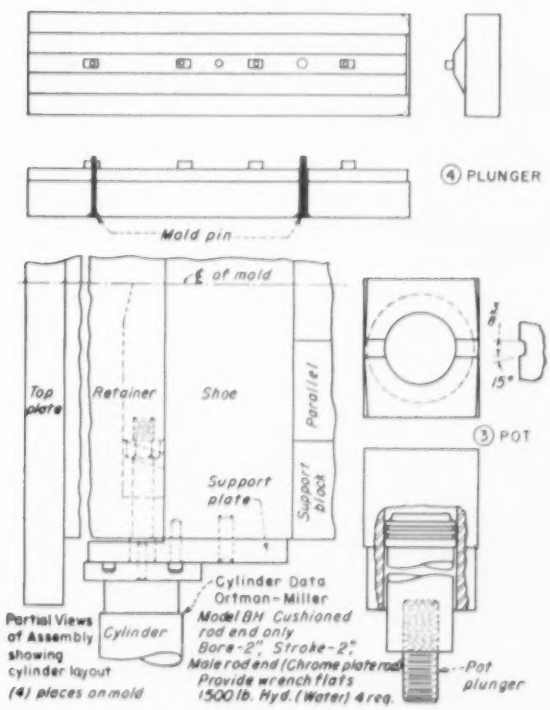
for nesting inserts and forming sides of terminal base. End wedges 6 and 7 close off one end of molded part, also contain the runner and gate. End wedges were also added to facilitate machining part profile through entire length of center wedge 4

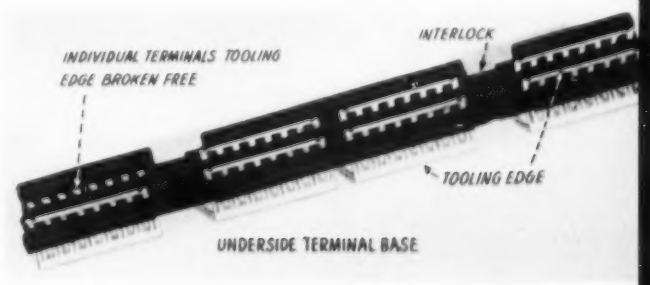
International Business Machines, Inc

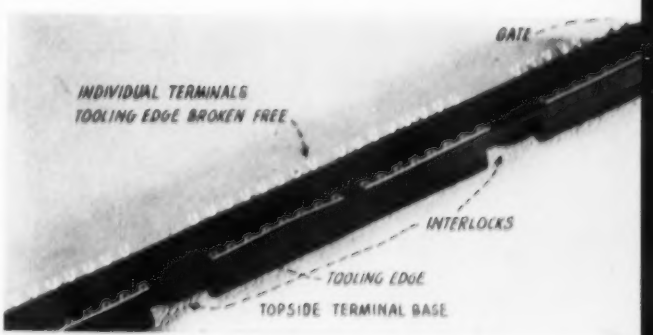

Locating pin for insert ③
① & ② INSERTS
(2) Dowel (through)
Enlarged partial view of slot
(4) Lift pins (actuated by bottom hyd cyl) prevent cocking wedge and provides movement independent of press stroke
Hole for locating pin
③ INSERT



Center wedge . . .
composed from inserts *1* and *2* is made in two halves to facilitate accurate machining of deep slot. Wedge forms and holds close tolerance on inside dimension of channel and nests the insert rail *3*. Note in photo preformed inserts are being accurately positioned between wedge and insert *3*. Pins protruding from worktable are used by operator to knockout the insert rail from wedge after the part has been molded. As operator is loading inserts into wedges another set of wedges is being run in the mold to eliminate idle molding time

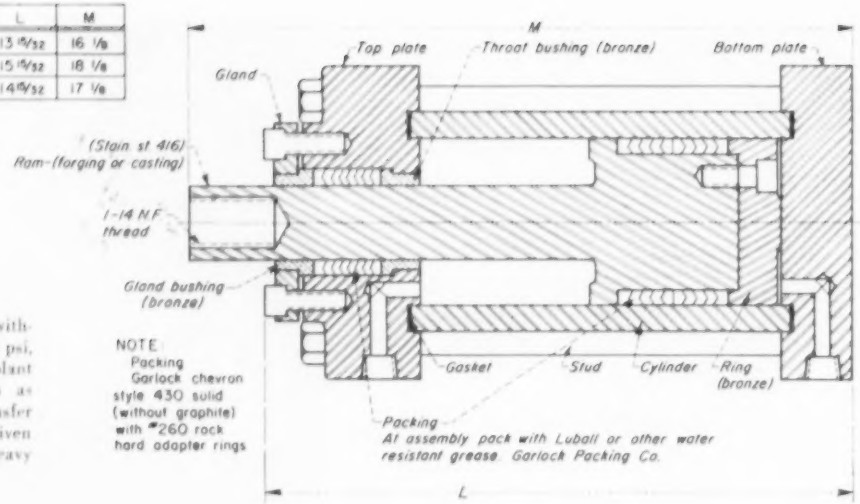




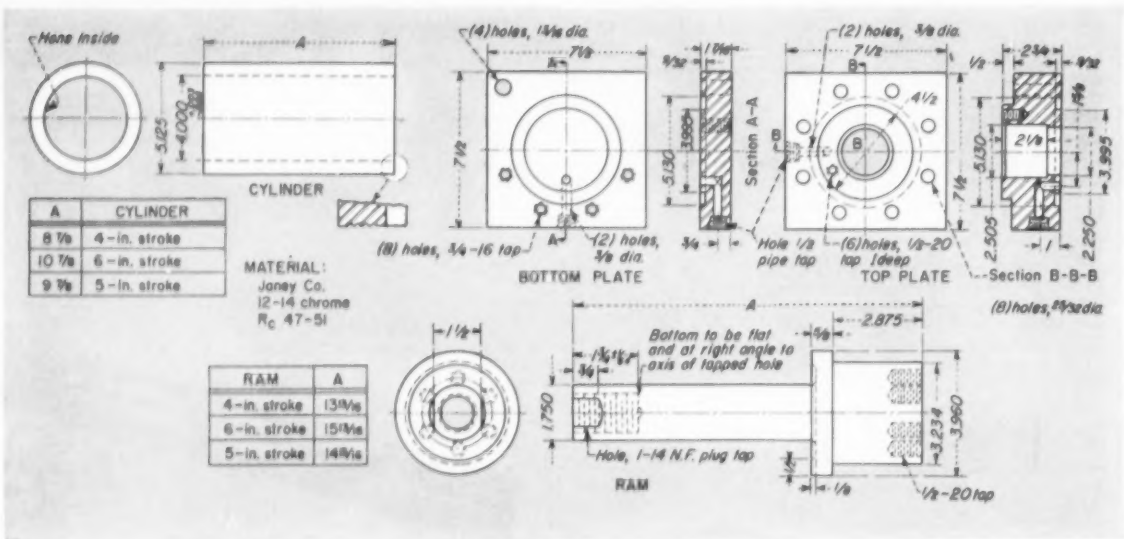


Close tolerances . . .
on molded parts are not difficult to maintain when mold is carefully designed and shrinkage has been determined. Photo shows one row of individual terminals from which surplus tooling material on insert has been broken free

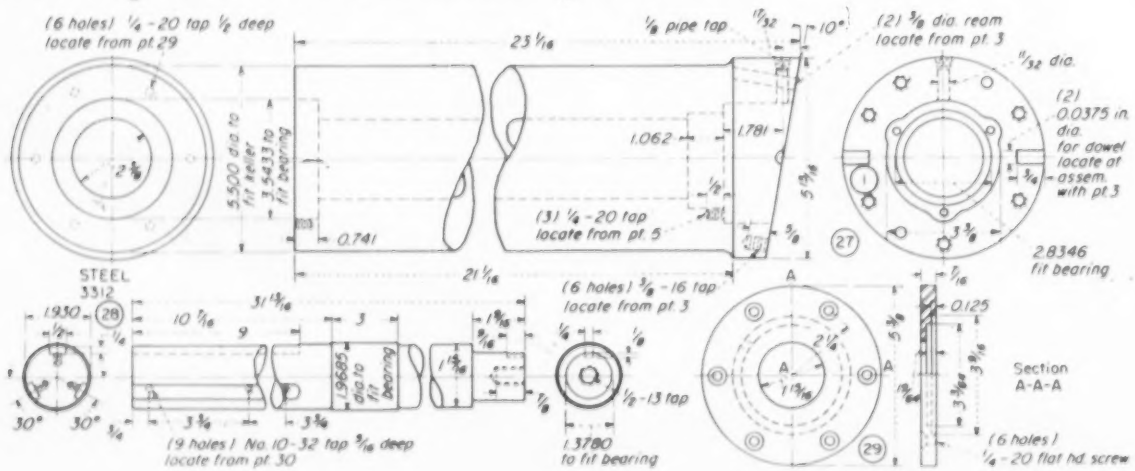
	L	M
4-in. dia.—4-in. stroke	13 15/32	16 1/8
4-in. dia.—6-in. stroke	15 15/32	18 1/8
4-in. dia.—5-in. stroke	14 15/32	17 1/8

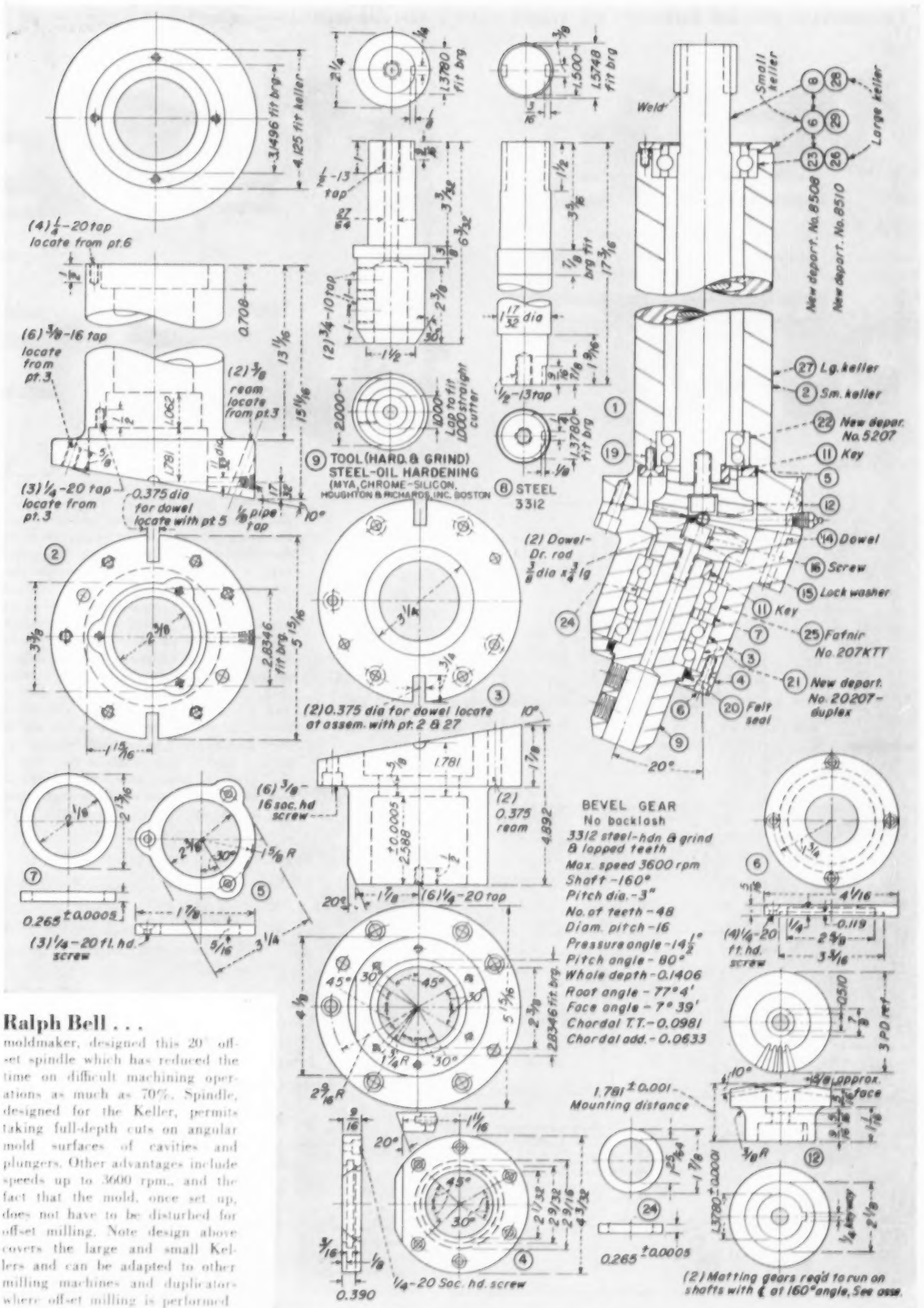


Hydraulic cylinders, 4-in. dia, designed to withstand pressures up to 3000 psi, are used throughout the plant for molding applications as well as on the bottom transfer units. Cylinders have given good service under heavy work-load demands



Offset spindle reduces machining time 70% ...

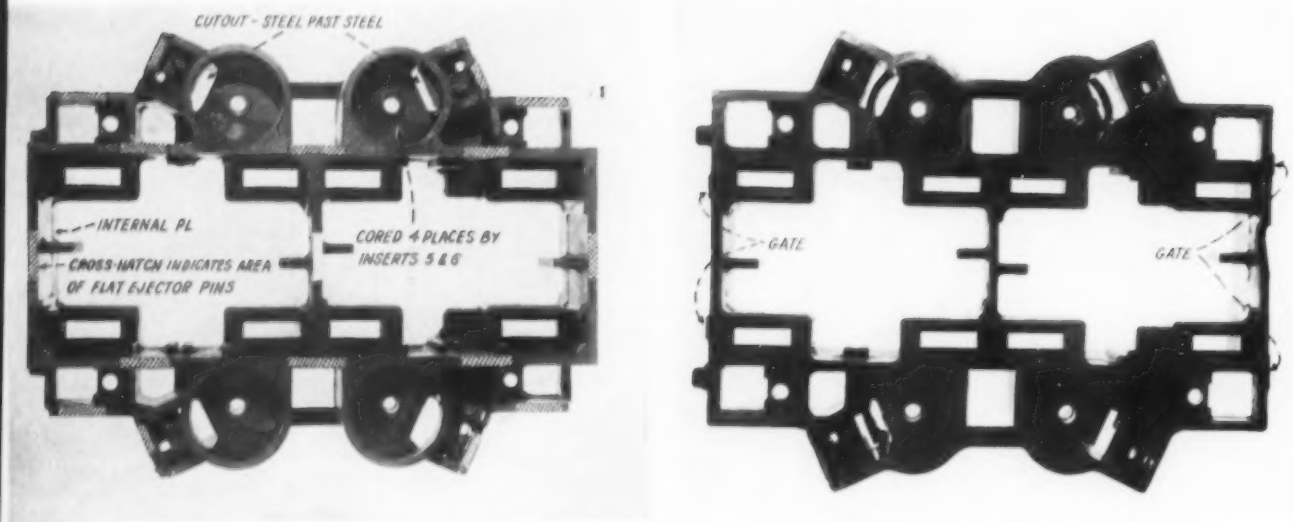



(4) 1/4-20 tap locate from pt.6
3.1496 fit brg
4.125 fit keller
(6) 3/8-16 tap locate from pt.3
(2) 3/8 ream locate from pt.3
(3) 1/4-20 tap locate from pt.3
0.375 dia for dowel locate with pt 5
1/8 pipe tap
(2) 1/2-13 tap
(2) 3/4-10 tap
1.3780 fit brg
1.5748 fit brg
1.5000
Weld
Small keller
Large keller
New depart. No. 8508
New depart. No. 8510
(9) TOOL (HARD. & GRIND) STEEL-OIL HARDENING (MYA, CHROME-SILICON, HOUGHTON & RICHARDS, INC. BOSTON
(8) STEEL 3312
(27) Lg. keller
(2) Sm. keller
(22) New depar. No. 5207
(11) Key
(14) Dowel
(16) Screw
(15) Lock washer
(25) Fafnir No. 207KTT
(21) New depart. No. 20207-duplex
(20) Felt seal
(2) Dowel-Dr. rod 3/8 dia x 3/4 lg
(2) 0.375 dia for dowel locate at assem. with pt. 2 & 27
(6) 3/8-16 soc. hd screw
(2) 0.375 ream
(6) 1/4-20 tap
(3) 1/4-20 fl. hd. screw
(4) 1/4-20 ft. hd. screw
1.781 ± 0.001 Mounting distance
0.265 ± 0.0005
0.390
1/4-20 Soc. hd. screw
(2) Matting gears reg'd to run on shafts with ℄ at 160° angle, See asse.
BEVEL GEAR
No backlash
3312 steel-hdn & grind & lapped teeth
Max. speed 3600 rpm
Shaft - 160°
Pitch dia. - 3"
No. of teeth - 48
Diam. pitch - 16
Pressure angle - 14 1/2°
Pitch angle - 80°
Whole depth - 0.1406
Root angle - 77° 4'
Face angle - 7° 39'
Chordal T.T. - 0.0981
Chordal add. - 0.0633

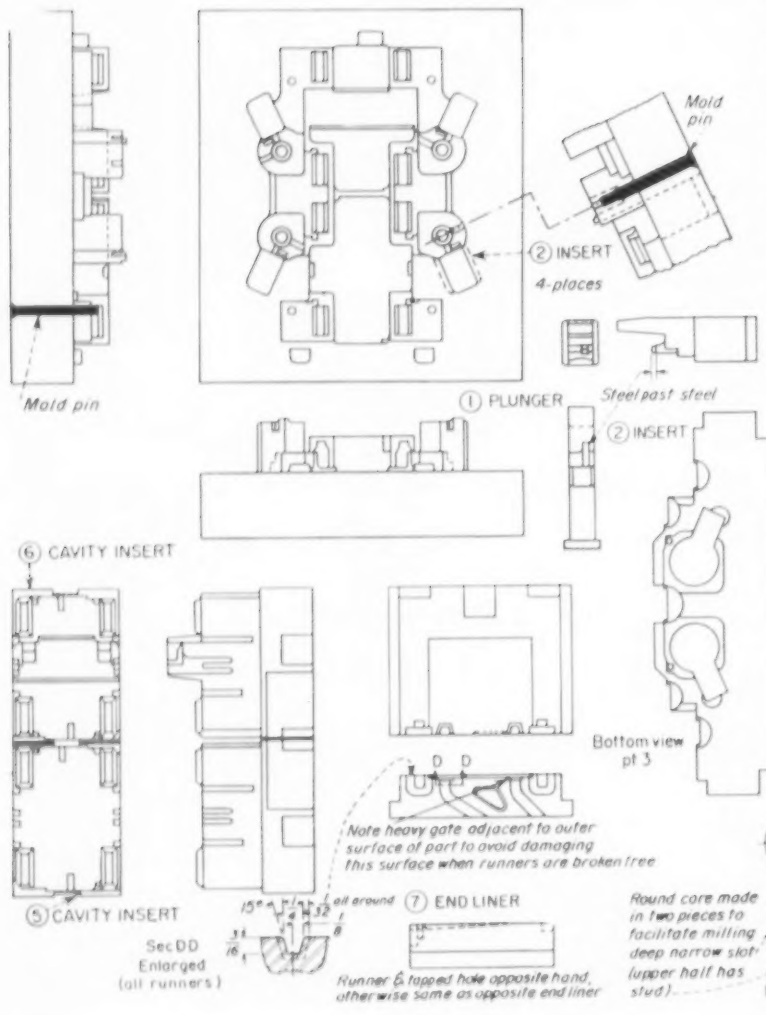
Ralph Bell . . .

moldmaker, designed this 20° offset spindle which has reduced the time on difficult machining operations as much as 70%. Spindle, designed for the Keller, permits taking full-depth cuts on angular mold surfaces of cavities and plungers. Other advantages include speeds up to 3600 rpm., and the fact that the mold, once set up, does not have to be disturbed for offset milling. Note design above covers the large and small Kellers and can be adapted to other milling machines and duplicators where offset milling is performed

Transfer mold has steel past steel in 20 areas


CUTOUT - STEEL PAST STEEL
INTERNAL PL
CROSS-HATCH INDICATES AREA OF FLAT EJECTOR PINS
CORED 4 PLACES BY INSERTS 5 & 6
GATE
GATE

Trumbull Co


Mold pin
② INSERT
4-places
Mold pin
① PLUNGER
Steel past steel
② INSERT
⑥ CAVITY INSERT
Bottom view pt 3
Insert ④ (4) places
③ SIDE LINERS (2)
D D
Note heavy gate adjacent to outer surface of part to avoid damaging this surface when runners are broken free
④ INSERT
⑤ CAVITY INSERT
15°
32 all around
⑦ END LINER
Sec DD Enlarged (all runners)
Runner & tapped hole opposite hand, otherwise same as opposite end liner
Round core made in two pieces to facilitate milling deep narrow slot (upper half has stud)
Enlarged partial plan view
Sec C

Double gating . . .
and two bottom transfer plungers are designed into this mold to permit even distribution of the plastic material over a large area and through the intricate-narrow passageways. Mold was designed primarily for ease of machining and maintenance. Although the initial cost of machining the mold was high, subsequent maintenance savings more than offset added original cost. Complete design of cavity and plunger called for 28 individual pieces, and there are 20 areas in which steel passes steel to seal off. Cavity inserts 5 and 6 are made in two pieces for ease of machining. Side liner 3 and end liner 7 are made in right and left hand

Round Table

Warning: Sick Leave A'Coming

"I've got an idea that ought to solve a lot of our scheduling problems in the summertime, Ed. How about getting the men to tip us off ahead of time when they're going to take sick-leave days?"

"What kind of orange juice did you have this morning? How is a man going to tell you ahead of time if he's going to be sick?"

"Oh, I mean the kind of sickness that ends up with the man going to a ball game, or fishing. You know."

"Yeah, I know; but it won't work, Al. I've had that problem for years; and all you can do is try to guess ahead. You can't expect a man to admit he's taking advantage of the company—and especially ahead of time."

"Well, why not, Ed? It might take some time to get their confidence; but if we kept it strictly a private affair it could work."

"Not a chance, Al. For one thing, how are you going to explain to Harrison how you can guess ahead of time about how many men are going to be on hand? You'd be putting yourself in a jam, as well as the men."

"That could be worked out, Ed."

"Maybe so, Al; but I don't want any part of it. If I was working for you, I'd be awfully careful about sticking my neck out like that. The temptation for you to take advantage of the information would be big."

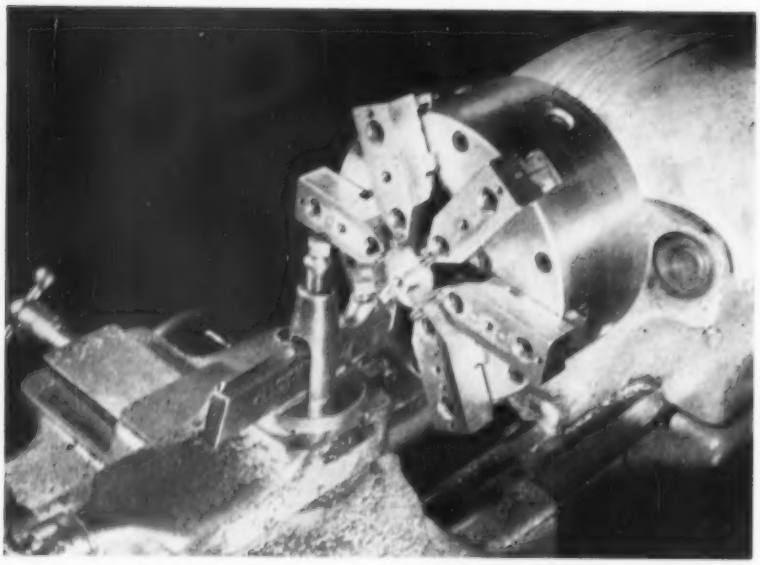
"Wouldn't you trust me?"

"Frankly, Al, no. Not that you aren't honest and don't intend well; it's just that too many things could go wrong. You might make a slip in front of Harrison, or he might get wise, or somebody in the department might snitch on you. It's too risky; and I don't believe a man on the floor would go along with it."

"I think I'll sound out a couple of my boys and see what they say. It would sure be worth it to me."

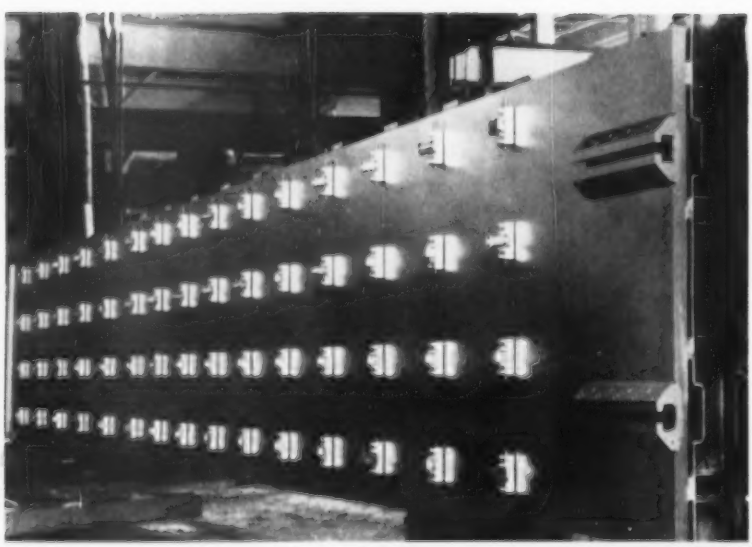
"You're too naive, Al. You'd better resign yourself to guessing, and let it go at that."

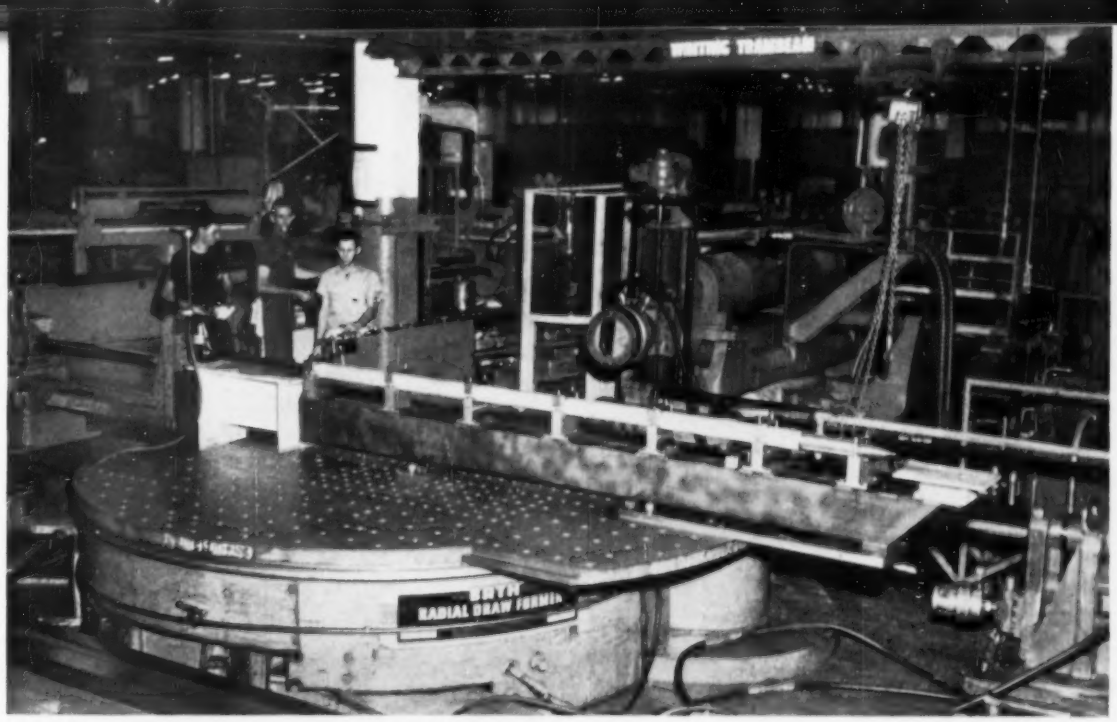
***SHOULD AL** forget the whole idea, or might it work? Is there any way of telling ahead of time how many men are going to be out for ball games or fishing? Your ideas may help others. Discussions of earlier topics start on page 222.*

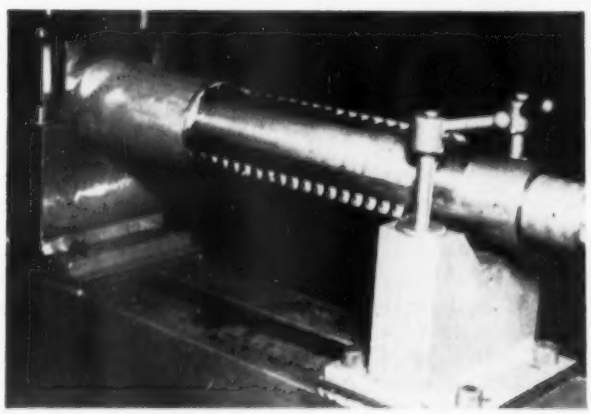


New shaft bores for commercial gears . . .
convert them to specials at an annual saving of $20,000. Original concentricity tolerance is 0.002 in.; final tolerance is 0.0005 in. after reboring. Chuck has six jaws and six adjustable pinions, which grip a master gear during set-up. After chuck has been reset to center master, it repeats to within required tolerance. *Curtiss-Wright Corp, Wood-Ridge, N J.*

Belt-grinding planer smooths alloy-steel plates...
for the flexible nozzle of USAF's Tullahoma transonic wind tunnel. Specs required a finish of 60 mu-in., and flatness within 0.003 in./in. across the 8-ft width; 0.019 in./8 ft along the 57-ft length. Plates were inspected every 6 in. after machining. In finished tunnel, big plates will be held in place by 60 jacking beams and lugs fastened on outer side. For various wind speeds, nozzle plates will be warped to calculated coordinates, thus changing the nozzle shape and controlling the airstream. *Baldwin-Lima-Hamilton Corp, Philadelphia.*







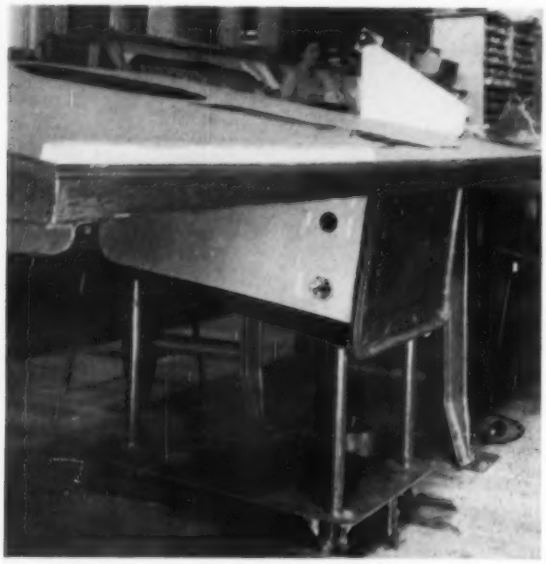
Broaching on a draw-forming machine...

isn't as silly as it sounds. Cyril Bath unit with 25-ton head has size and beef to pull three-tip tool through 6061-T6 aluminum tubing 9 ft long. It beats a planer because starting and stopping are cushioned, preventing shocks. Working head has three floating wear plates and three cutting tools, all adjustable for dia. *Chance Vought Aircraft Co, Dallas, Tex.*

Warm boring bars hold tolerances . . .

as close as 0.0005 in. even during first hour of new shift when friction heat has-n't had a chance to heat the machine. Work is engine blocks; operation is boring cam and crankshaft main bearings. Pyrometer measures surface temperature of bars at 110 F; result of heat from four lamps mounted on machine. *Plymouth Div, Chrysler Corp, Detroit.*

Practical Ideas . . .



Vertical Press on its Back Assembles Wires & Terminals

This Burndy Bandolug machine has been installed in an unusual manner for a particular job. The work is a wire harness for an electrical assembly, and the machine is used to assemble a terminal connector to the end of each wire in the harness.

The reason for the unusual installation is the usual difficulty with cutting all wire lengths exactly right before they are bound into the harness. In this case, the harness is made up with the wires somewhat extra long.

The machine is horizontal because working with the harness on the table cover that partly hides the machine is much easier than if the machine were vertical. In addition, the working machine parts that hold the connectors are more visible, and inserting the wires into the terminals is easier.

At left is illustrated an operator inserting pre-stripped leads into the terminals. Beyond her is a vertical plywood board with pulleys and a weight, with which she subjects each wire-terminal connection to a 15-lb pull test. Below is the machine with table cover removed. The special cart supporting the machine allows rolling it out for servicing. Above is the complete installation.

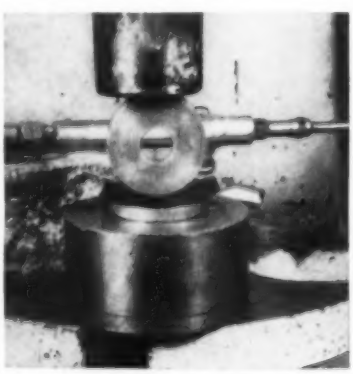
The only change to the machine was to add a thrust bearing to give it support in the horizontal position that it would not normally require in the vertical position.

J R Landreth, Western Electric Co, Greensboro, N C, and David Dibner, Burndy Engineering Co, Norwalk, Conn

Bending Shortcuts Job of Machining Toolpost Rocker

When we have to replace a broken toolpost rocker for a lathe, instead of machining it from the solid to produce the curves required, we bend it from flat stock in a small hydraulic press.

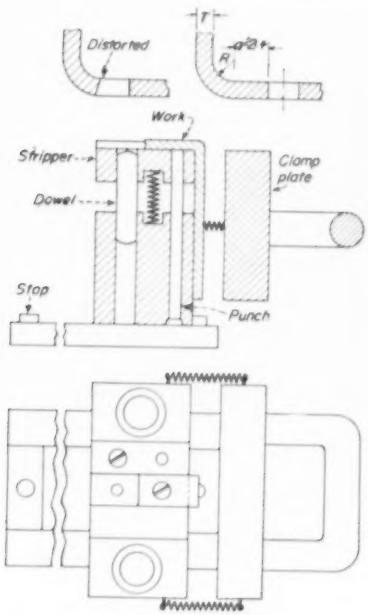
Mild steel is cut to the proper size, then heated red hot with a welding torch and placed on the toolpost ring it will fit. This is set in the press, and a piece of round stock is located on top, as illustrated. The rocker bends easily, with little or no springback because it is hot. Afterward, the top of the rocker is milled flat, and the bottom filed smooth. Remember



that the bottom is part of a spherical surface, so file accordingly.

To finish, the rocker is lightly case hardened.

H Gerber, Stillwater, Okla



Short-Stroke Die Pierces Close to Bends

When pierced stock is bent, distortion of the stock close to the bend may ruin the roundness of a hole close to the bend. For this reason, the edge of any hole should be about twice the stock thickness away from the center of the inside radius of the bend, at a minimum.

But if the hole must be closer, it should be pierced after bending. Often a die with a cam-actuated holding device or a spring-loaded stripper is used for this job, but such dies are most frequently complicated and expensive. Also, the press stroke is fairly long for such a die, which may be a distinct disadvantage.

Our solution to the problem involves a fairly simple short-stroke die that evolved after trying many kinds of dies. It's an upside-down die with the punch in the lower part. The whole punch block and stripper assembly are mounted on rails, with a stop at the left side to locate it directly under a flat, pierced punch plate in the press ram.

To load, the die is pulled to the right (or to the front of the press), and when the punch block stops, the handle is pulled a bit more to allow loading the bent part. When the handle is released, heavy tension springs between the clamping plate and the punch block clamp the plate against the work, which holds it in position.

Now the punch block is pushed to the left against the stop, and the press is actuated. The die plate comes down, compressing the stripper and making the work come down over the punch. A suitable hole must be drilled in the die block to clear the punch.

When the ram rises, the work is automatically stripped, and when the die block is again pulled to the right against the stop, the clamp plate releases the work, which is picked up out of the die.

Slugs are ejected through the hole in the die plate above, and the press is inclined to get them out of the way.

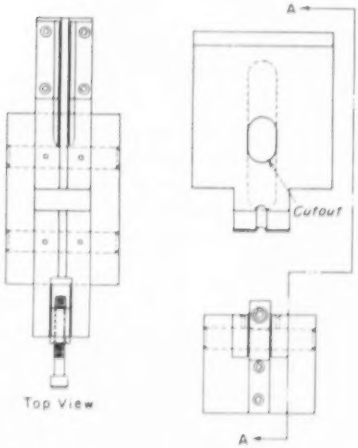
The die set works well, and lasts a long time. Parts are pierced without distortion because they are firmly supported.

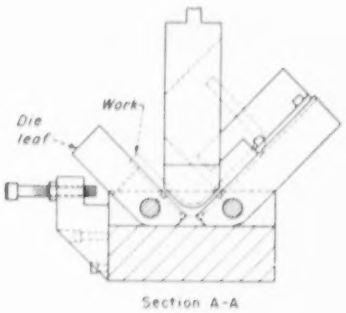
Federico Strasser, Santiago, Chile

Bar Shear on Wheels Clips Stock any Length

A small bar shear can be mounted on rollers or railroad-style wheels and run back and forth on floor rails next to a press, or even a lathe, to cut stock to length. The wheels can be chocked if a number of pieces are to be cut the same length, or the shear can be moved between cuts for odd lengths. This might be especially useful if a piece of bar or thin flat stock can only be cut to length after a preliminary operation.

Williams White Co, Moline, Ill





Moving-Leaf Forming Tool Bends Rounds Without Marking

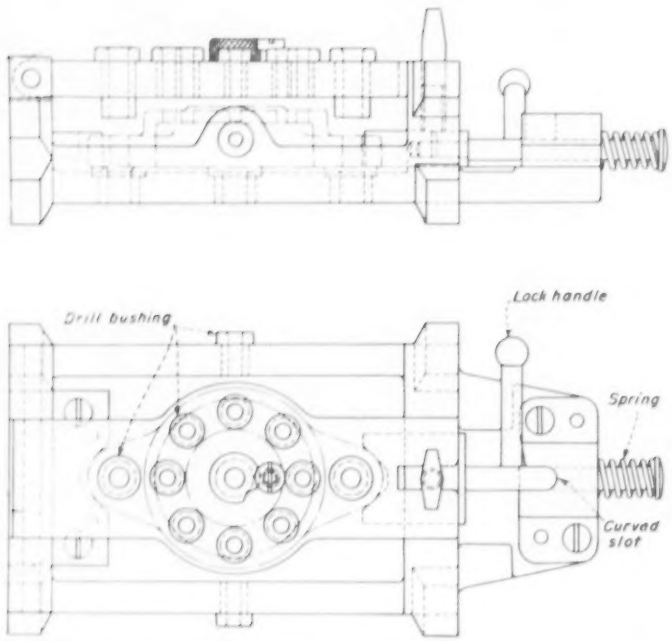
Bending round stock into squares is the function of this press tool. It has a simple vertical-motion punch with a cutout that prevents interference with the work when the part is half formed.

The die consists of a solid base with two hinged die leaves. These, and the punch, are milled to a half-circular form to keep the stock straight and in position. An end stop attached to the base locates stock before the press stroke starts.

As the press ram comes down, the pivoted die leaves start from a flat position, but tilt gradually as the punch forces the work to bend. The shape of the bottom ends of the leaves controls the maximum amount of bend.

The die set supports the work fully, maintains exact squareness, and doesn't leave tool marks on the work.

L Labelle, RCA Victor (Canada), Montreal



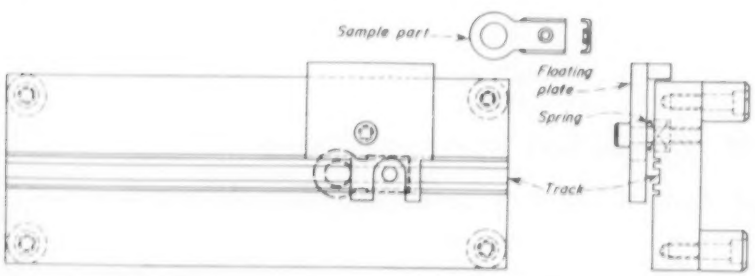
Bolt-Action Drill Jig Grips Parts Fast

This jig works much like a rifle, with a clamping bolt that moves the same way, and which locks quickly when turned down. There is the addition of a spring behind the bolt to pull it back when released.

Eleven holes are drilled in the top, and two in the sides of the workpiece. Suitable feet are provided on the jig body.

Work is held between two V-blocks, one fixed, and one attached to the bolt. Clamping from the side is not necessary because the baseplate prevents work tilting.

Hjalmer Dahl, Upplands Vasby, Sweden



Tapping Slide Aligns Small, Thin Parts

Thin nuts and sheet-metal parts that must be tapped can be kept in order and alignment with this kind of work slide. It is made with a fairly heavy base that sets on the tapping table, and might also be fitted with replaceable slides if many different parts were to be tapped.

The base will hold a number of parts, which slide to the left as the operator pushes new ones into tapping position. The floating plate may be tightened over each part to grip it tightly to prevent motion during tapping. Parts can fall into a tray at the end of the slide.

T O Spour, Weston, Ontario

Winner No. 247

RICHARD S FAGERMAN, CHICAGO, ILL

won $25 in addition to regular payment for his idea:

OFFHAND CENTERLINE METHOD

in the issue of March 26, '56

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

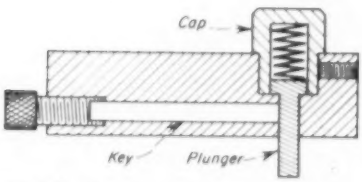
WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

Keyway Repair

If the sides of a keyway break away, shape a piece of battery carbon to the size of the key, clamp it in the keyway, and carefully weld up around it. Carbon isn't affected by torch heat, and it knocks out easily when the weld has cooled.

Harry J Miller, Sarasota, Fla



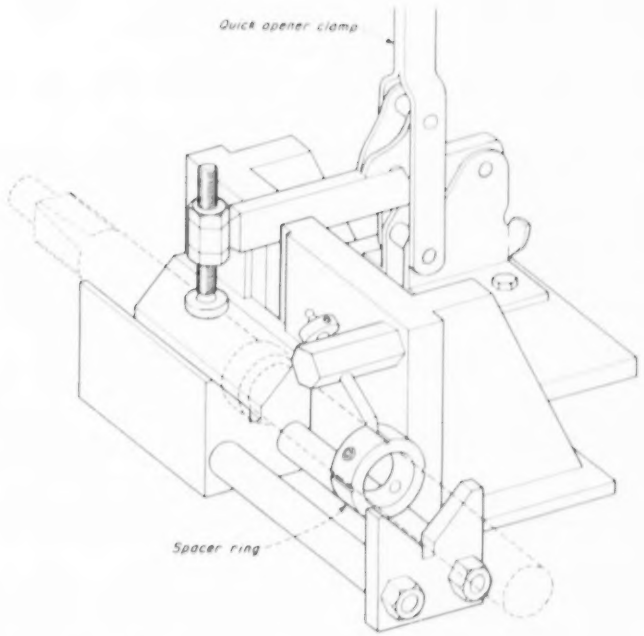
Depth Gage Transfers Precise Dimensions

Accurate depth gaging can be done with this kind of tool, which can often substitute for a regular depth micrometer. It can be made any size.

The cap, retained by a setscrew, keeps the compression spring bearing on the top of the plunger. When the knurled screw at the side is released, the plunger will go to the bottom of the hole—providing it is within range of the tool. As the body of the tool is held against the work face, the knurled screw is tightened. Then the depth of hole can be taken from the tool.

Distance from the bottom of the body to the top of the cap (which is adjustable), can be any known distance. Measuring from the tip of the plunger to the top of the cap, you have your depth of hole, plus this known distance.

Edward R Taylor, Galisburg, Ill



Lathe With Squaring Attachment Mills Valve Stems Faster

The compound rest of one of our lathes can be fitted with this attachment so we can mill square tapered flats on valve stems with a side milling cutter chucked at the headstock.

Key to the alignment problem is a spacer ring, accurately made to slip over each valve stem, and slotted each 90° around the OD. These slots are picked up by a sharp-pointed index finger on the attachment, which insures that we can index each stem accurately. The spacer ring is clamped with setscrews to the stem, and is not released until all the flats are milled.

A 5° taper is required on each flat, so we align the compound rest to hold the work at this angle to the cutter. The quick-acting clamp bears directly on the valve stem.

John Proctor, Pasadena, Calif

Double Indicator Setup Checks Two Dimensions

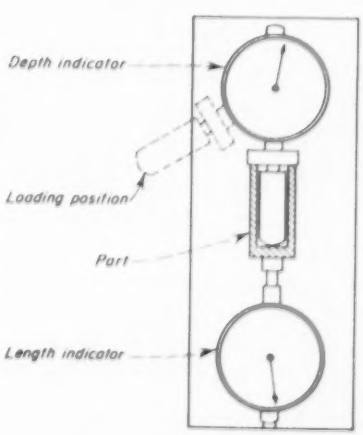
Simultaneous inspection of two lengths on this shell workpiece are possible because the indicators are set up on a firm base with an accurately positioned stop attached to hold the work.

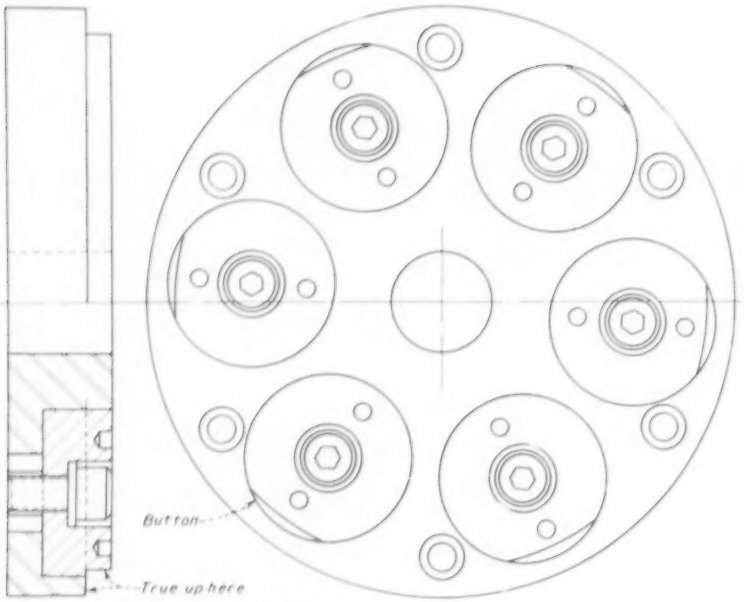
The upper indicator is on a short spindle, and can swivel outward so work can be loaded. Stops underneath prevent it from swinging too far, and position it accurately in line with the other indicator.

Work is positioned against the fixed stop, attached to the body of the indicator. Thus, the reading on the lower indicator will give us total length. If the work is held tightly against the stop, the reading on the upper indicator will give us the depth of the hole.

The upper indicator has a special contact point made to slide freely inside the hole in the work. To make sure the work is touching the stop when readings are taken, it can be hand-held, or the lower indicator can be one with heavier spring force.

L. Getler, Bloomfield, N J





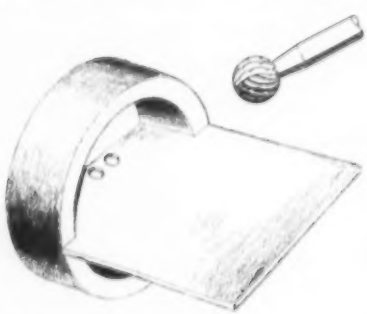
Button Faceplate Holds Size and Concentricity

Our VTL's and turret lathes often use this kind of button faceplate, which is quite simple to retrue. Each time a new OD is required, the buttons can be rotated and recut to the diameter required for workholding.

First time the plate is set up on the lathe, the OD and edge of the baseplate are trued to that machine. Then the OD across the buttons is turned as required.

Smaller buttons can be installed if the diameter required is fairly small. If a locating button is required, it can be attached with an Allen screw.

John E Ham, Gen Foreman, DeLaval Separator Co, Poughkeepsie, N Y



Spherical End Mill Cuts Partly Hidden Holes

When we recently had to drill two small holes in an assembly where the holes were protected, as illustrated, we made a spherical end mill to get into the work from an angle. The tool looks like a burr.

The sphere is the same dia as that required for the holes, and the shank is half of that dia. A vertical miller was set up with its head at an angle, the work was located right under the cutter, and the table was raised.

There's a limit to the depth of hole that can be cut this way, of course. Actually, you can only cut completely through stock as thick as the distance from the widest point on the spherical cutter to where the stock interferes with the shank. The more nearly vertical you can make the milling spindle, the deeper a cut you can make.

Frank J Reynolds, New Brunswick, N J

Flywheel Cuts Down Cutter Chatter

We have had some trouble in the past with underpowered machine tools, which have caused chattering cuts and heavy vibration in the shop. One way to overcome 75% of this chatter is to add a flywheel to the offending machine.

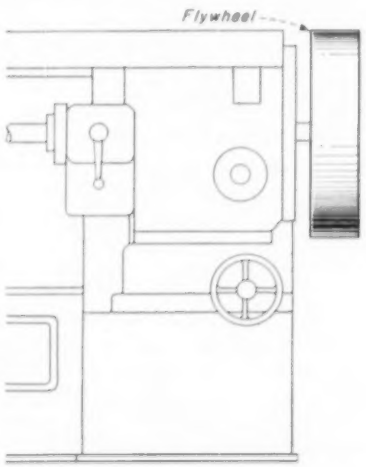
One example was a cut being milled ⅛ in. deep and 4 in. wide. We estimated we needed a 100-lb flywheel, so we cast it and machined it all over. An adapter was made to fit the rear end of the main spindle, and the flywheel was mounted on the adaptor. One suggestion we would make to machine-tool builders is that they make the spindles longer so a flywheel can be added at any time it's required.

Another method of reducing vibration is to use cutters with spiral teeth, so the next tooth engages the work before the previous tooth comes completely out.

The flywheel has no effect on the power required in milling. No matter how rugged a setup is established, with oversize arbor and outboard support, there will be spring in the arbor when the cutter is working. This can be absorbed by a flywheel.

George F Oliver, Allstates Co, Albany, N Y

(Note: One exception we would make to the last paragraph is that the flywheel will increase starting load on the motor.—Ed)



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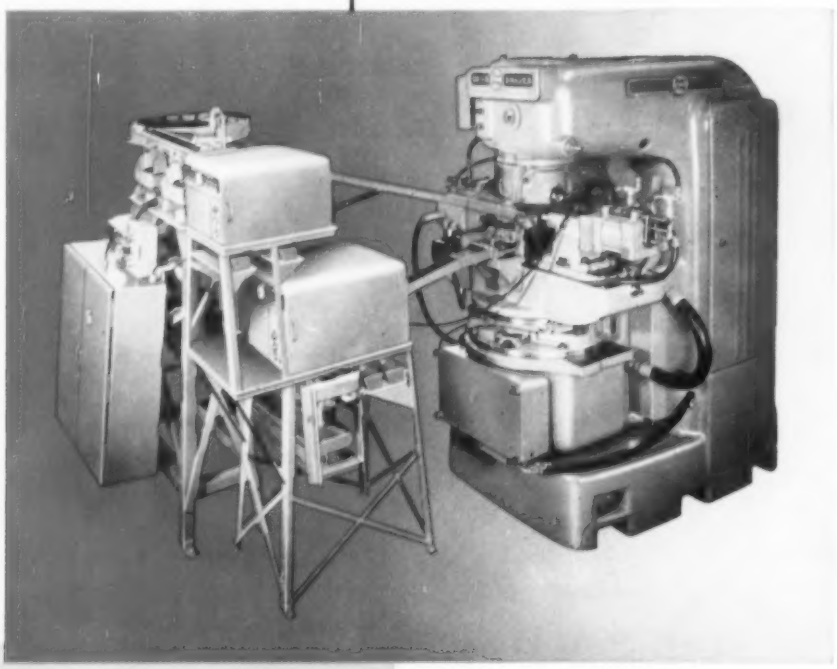

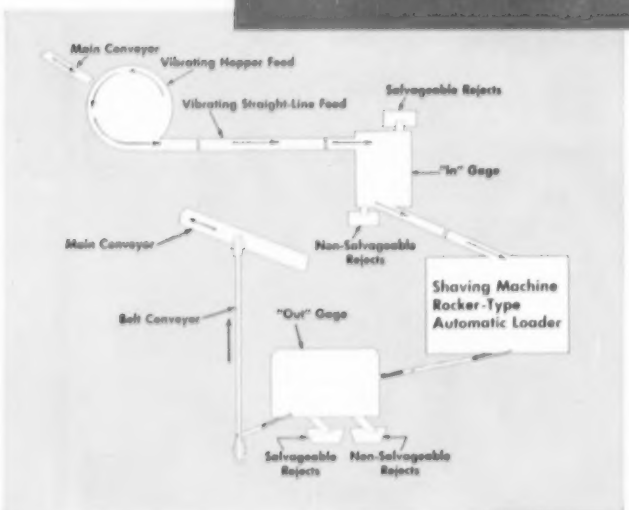

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Speeds for Mounted Wheels . . . I

Correct application of mounted wheels depends on the observance of three rules, according to the Safety Committee of the Grinding Wheel Institute. If these rules are followed, the bending or breaking of mandrels and excessive vibration will be avoided.

Rule No. 1.—Mandrels

The maximum safe operating speed for mounted wheels shall be determined by three factors:

1. Shape and size of the mounted wheel.
2. Size of mandrel.
3. Overhang of mandrel.

Taking the three factors into consideration, look up the maximum safe operating speed in the corresponding tables, page 165, or in succeeding numbers. The overhangs indicated on the charts are for unthreaded mandrels.

Exception. Under certain ideal conditions of truth and balance, it may be permissible to operate at a speed higher than the indicated maximum safe operating speed, if speed in Rule No. 2 is not exceeded.

Rule No. 2 — Maximum Operating Speed

Table A. These speeds shall not be exceeded even though higher speeds than the maximum safe operating speed are used under the exception in Rule No. 1.

OD In.	Rpm
1/4	152,800
5/16	122,200
3/8	101,900
7/16	87,310
1/2	76,390
5/8	61,120
11/16	55,560
3/4	50,930
13/16	47,010
7/8	43,650
15/16	40,740
1	38,200
1 1/8	33,950
1 1/4	30,560
1 3/8	27,780
1 1/2	25,470
1 5/8	23,520
1 3/4	21,830
2	19,100

These speeds are based on the strength of vitrified, resinoid and rubber mounted wheels of average grade. Wheels over 2 in. diameter follow standard unmounted wheel speeds.

Rule No. 3—Work Pressure

Pressure between wheel and work shall at no time be so heavy that any considerable springing of the mandrel will result, particularly with small wheels where the end of the mandrel that enters the wheel is of reduced diameter.

Ordinarily, the work pressure will not be excessive unless an attempt is made to force the wheel beyond its cutting capacity. An experienced operator can tell whether or not a wheel is cutting free. If the wheel causes burning of the work, it is likely that excessive pressure is being used. A softer grade of wheel may permit the desired rate of stock removal without using excessive pressure.

Maximum Safe Operating Speed

Every mandrel with a wheel mounted on it has a certain maximum speed at which vibration due to deflection tends to become excessive. This speed varies with the following conditions:

1. Dimensions of wheel
2. Diameter of mandrel
3. Distance from support to base of wheel.

Therefore, these effects should be considered:

Increasing the size of the wheel (either diameter or thickness) will generally lower the maximum speed. Reducing the size of the wheel (either diameter or thickness) will generally raise the maximum speed.

Increasing the diameter of the mandrel will raise the maximum speed. Reducing the mandrel diameter will lower the maximum speed.

Increasing the overhang (distance from end of support to base of wheel) will lower the maximum speed. Reducing the overhang (pushing the mandrel back into the chuck) will raise the maximum speed.

The maximum speed is not measurably affected by the short taper and reduced diameter at the end of the mandrel to which wheels of very small size are attached. (Shapes B 43 to 47, etc.). For all practical purposes the maximum speed for this type of mandrel wheel assembly can be considered the same as if the mandrel were of uniform diameter throughout its length.

The condition of the machine spindle and bearings may to some extent modify the maximum speed. Also, greater run-out and out-of-balance of the wheel as mounted, will decrease the maximum speed.

Operating Recommendations

The tables that appear on page 165 or in a succeeding number, indicate the maximum speeds for various mounted wheels in combination with several mandrel sizes and various overhangs. These are for unthreaded mandrels. For many common combinations the maximum speeds can be read directly from the tables. For intermediate wheel and mandrel sizes and overhangs not shown, the maximum speed can be estimated by interpolation.

Threaded Mandrels

The maximum speed of mounted wheels with threaded mandrels is lower than for similar wheels with unthreaded mandrels. However, as there is in general no overhang on threaded mandrels, the speed will be the same as for 1/2 in. overhang unthreaded mandrels.

Length of Mandrel Projection

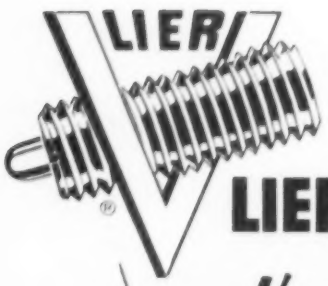
The standard length of mandrel projection is 1 1/2 in. measured from the back face of the usable abrasive to the end of the mandrel. Other projections available are: 1, 2, 2 1/2 and 3 in.

Diameter of Mandrels

The standard 1 1/2 in. long mandrel is available in the following standard diameters (chucking diameter): 1/8, 1/4, 3/8, and 1/2 in.

Mandrels in lengths other than the standard 1 1/2 in. are also available in one or more of the above diameters when required:

Dia. Proj.	Dia. Proj.
1/8 x 1	1/8 x 2
1/4 x 1	1/4 x 2
3/8 x 1	1/8 x 2 1/2
1/2 x 1	1/4 x 2 1/2
1/8 x 1 1/2	1/8 x 3
1/4 x 1 1/2	1/4 x 3
3/8 x 1 1/2	
1/2 x 1 1/2	



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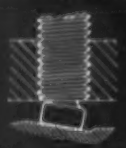
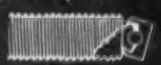
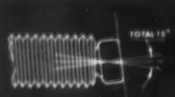


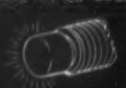
- Screw torque absorbed by pad—not the work piece.



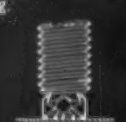
- Unique ball-joint construction provides extremely smooth angle adjustment and rotation of pad.



- Pad swivels 7½° each side of center line in all directions.



- Large flat pad area assures tighter clamping.



- Conical seat distributes clamping pressure uniformly.
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- Made from heat-treated, alloy steel to last for years.

—*Pat. Pend.*

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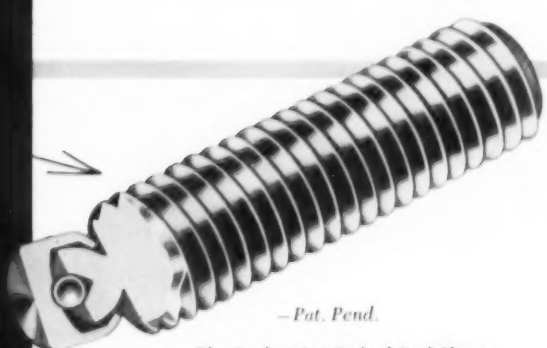

—*Pat. Pend.*

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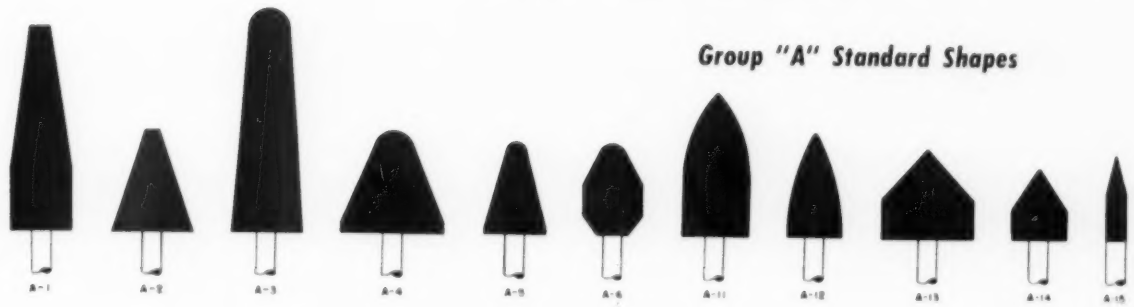
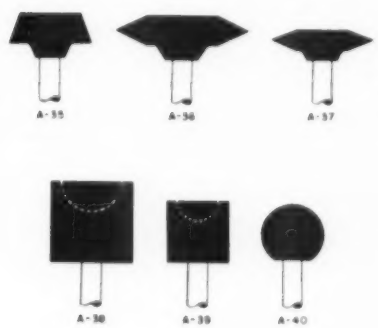
Speeds for Mounted Wheels . . . II

Group "A" Standard Shapes

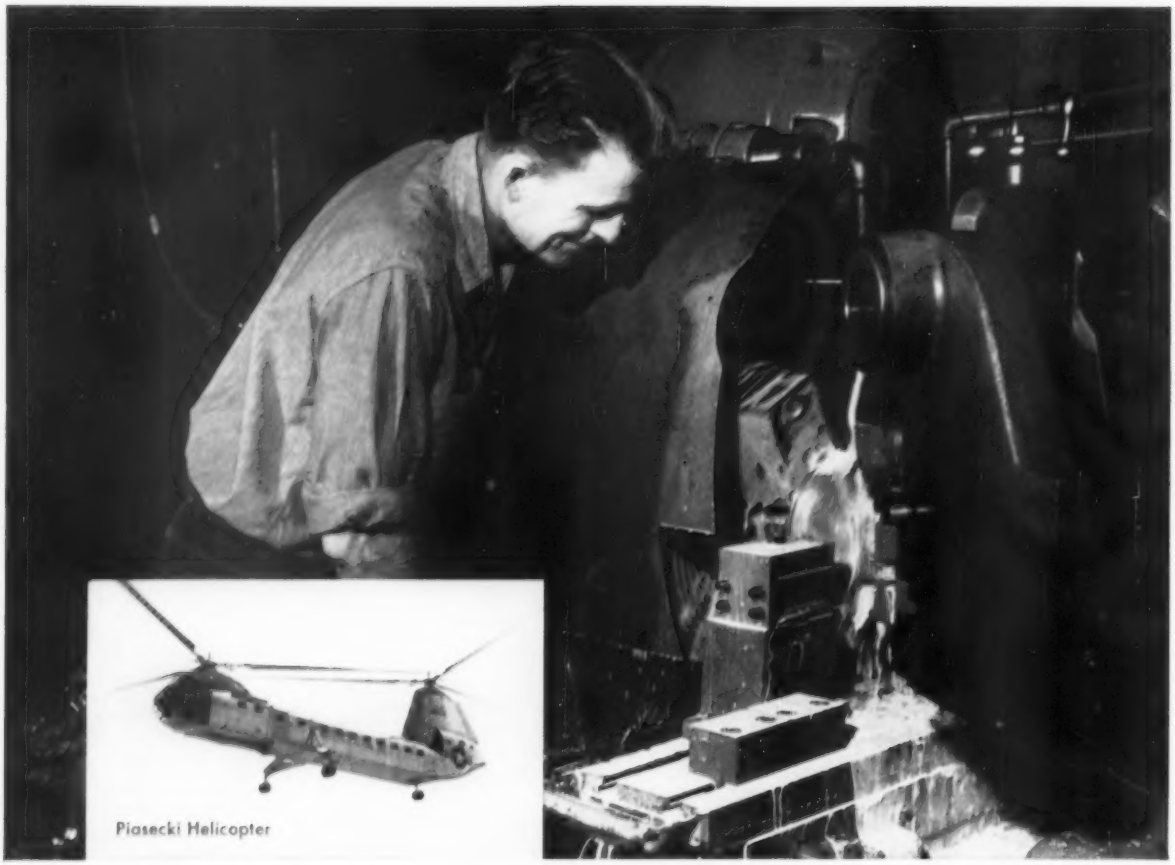




Maximum Safe Operating Rpm for "A" Wheels*

Shape No.	Shape Size		Overhang—Dimension O—in.					
	Dia	Thickness	½†	1	2½	2	2½	3
A 1	¾	2½	19,800	16,500	13,120	10,650	9,000	6,750
A 2	1	1¼	38,200	32,620	25,500	20,620	16,870	13,500
A 3	⅞	2¾	18,000	14,620	12,000	9,750	7,500	5,250
A 4	1¼	1¼	30,560	24,750	20,250	16,120	13,120	10,500
A 5	¾	1⅝	45,000	33,750	27,000	21,000	16,500	13,500
A 6	¾	1⅛	39,000	29,700	24,000	18,970	15,000	12,000
A 11	1¼	1¾	27,520	21,900	18,000	14,620	12,000	9,370
A 12	1¼	1¼	48,000	35,250	27,370	21,750	17,250	13,500
A 13	1⅛	1⅛	33,950	32,250	25,500	20,620	16,500	12,750
A 14	1¼	⅞	55,560	40,500	30,750	24,370	19,500	15,000
A 15	¼	1 1/16	72,750	47,620	34,500	26,250	19,870	13,870
A 21	1	1	34,500	26,250	21,000	17,250	13,870	10,870
A 22	¾	¾	50,930	40,500	30,750	24,370	19,500	15,000
A 23	¾	1	39,370	30,370	24,370	19,500	15,000	12,000
A 24	¼	5/16	76,500	49,500	36,370	27,000	20,250	15,370
A 25	1	1	35,620	27,370	22,120	18,000	14,250	11,250
A 26	5/16	5/16	61,120	46,500	35,250	27,750	21,370	15,750
A 31	1⅜	1	27,780	26,250	21,000	17,250	13,500	10,870
A 32	1	5/16	38,200	38,200	30,000	24,000	18,900	15,000
A 33	1	½	38,200	38,200	30,000	24,000	18,900	15,000
A 34	1½	⅜	25,470	25,470	25,470	21,970	18,000	13,870
A 35	1	⅜	38,200	38,200	31,500	25,500	20,250	15,900
A 36	1⅝	⅜	23,520	23,520	23,520	21,750	17,620	13,870
A 37	1¼	¼	30,560	30,560	30,560	28,120	22,500	18,000
A 38	1	1	34,500	26,250	21,000	17,020	13,500	10,650
A 39	¾	¾	47,250	35,250	27,750	22,120	17,250	13,120

* *For ¼-in. mandrels*
† *Also for threaded mandrels*



Sun's Heavy Duty Emulsifying Cutting Oil excels on high-alloy aircraft steels

S.E.C.O. Heavy Duty handles all machining jobs requiring an emulsifying cutting oil. Piasecki Helicopter's large job shop at Morton, Pa., found this out three years ago when S.E.C.O. HD* replaced two expensive heavy-duty soluble oils in machining fan hubs.

Extremely versatile and moderately priced, S.E.C.O. HD has been doing an exceptional job in cutting a variety of high-alloy aircraft steels for Piasecki.

For more information about S.E.C.O. HD, see your Sun representative. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-6.

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- *Cutting and Grinding Facts*
- *Disposal of Waste Emulsions*
- *New Improved S.E.C.O.*
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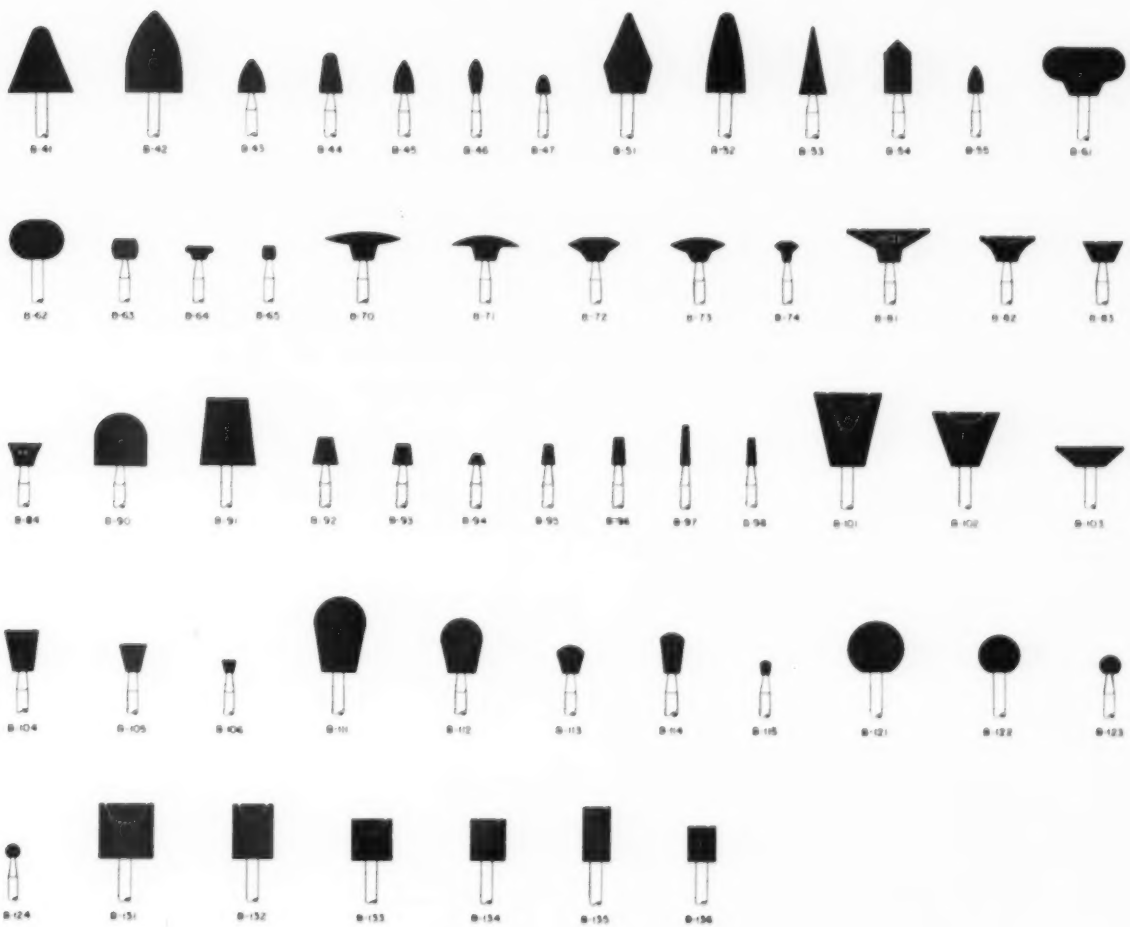
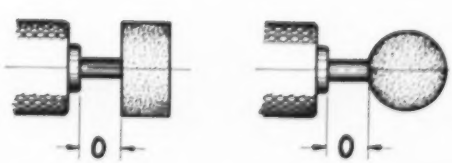
American Machinist **REFERENCE BOOK SHEET**

Speeds for Mounted Wheels . . . III

Group "B" Standard Shapes





Overhang O affects safe operating speed

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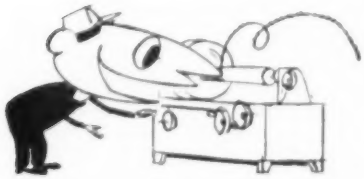
Talking Shop . . .



Nose to Toolbit

CHASE MANHATTAN BANK recently placed a full-page ad in magazines showing an operator with his nose practically up to the toolpost, and a healthy chip coming off—but no safety glasses. Five or six letters brought out the danger of blinding—so a new ad was substituted, showing the operator wearing safety glasses. Now, it's time somebody pointed out that his face shouldn't have been so close in the first place.

Vacuum Comes Along

VACUUM CASTING of large forging ingots will be begun on an experimental basis by US steel at Duquesne Works. This is the first attempt in the United States to use the process. It is expected to reduce gasses trapped in steel and thus avoid gas pockets and quality loss.

Ceramic Sidelight

OUR ENGLISH EDITION reports that Lodge Plugs Ltd, Rugby, England, has an order for two million cutting-tool tips (from Sintox Corp of America) made from Sintox ceramic as a result of the recent Tool Show demonstrations. Says the story: "As a result of this order, the whole output of tips from Rugby will this year be allocated to America." Sintox tools are a joint development of the material by Lodge (evolved from the company's spark-plug insulators) and the mechanical clamping arrangement by Sintox Corporation of America.

No Jigs

SOME PARTS are so complex that it may be cheaper to produce them one at a time on a universal machine rather than by making jigs and fixtures. In one case, an aircraft plant takes 56 cuts at all kinds of angles on a peculiar piece. The job is done to top fixture accuracy in a B & S Omniversal miller, but at reduced cost because of lowered investment.

Building Up Again

ELECTROFORMING—"building up the part around the holes" by plating—is being used to fabricate vacuum-tube envelopes, waveguides and similar microwave components of copper. Parts are usually 0.150 in. thick, and are plated onto stainless-steel mandrels in an acid-copper bath at room temperature with current density of 10 amp/sq ft. Linear-accelerator sections are similarly formed on a basis of alternating copper disks and aluminum spacers, copper being plated to ⅜ in. thick over the silver-plated stock, then the aluminum etched out with hot sodium hydroxide. Such pieces are vacuum tight and have high electrical conductivity. See PB111960, "Electroforming of Copper for High-Vacuum Applications," available from OTS, U S Dept of Commerce, Washington 25, D C. Price 75 cents.

Anti-Heat Paint

TEMPERATURES up to 1400 F are withstood by a ceramic-frit, silicone-resin paint just developed by the Army Corps of Engineers. It will work, for example, on auto mufflers and manifolds. Commercial heat-resisting paints, including those pigmented with metallic powders, are not as good as this one, which is a blend of ceramic frits, pigments and refractories. It has pigment volume concentration of 35 to 40%, with frit to pigment and refractory ratio of 3 to 1. Data and a procurement spec are included in PB111957, "Development of Heat-Resistant Paints," available from OTS, US Dept of Commerce, Washington 25. Price is $4.

Goodbye, Keg!

THE OLD NAIL KEG is no more—it has been supplanted by a fiberboard carton that saves up to 70% in storage space, is easier to identify and handle, and is less likely to break in shipment. Cartons can be stored before filling and disposed of afterward far more easily, too.

Two at a Time

TWO PARTS at once, per cycle, can be made on an automatic—a practice that is not generally known. B & S engineers demonstrated this recently on an aluminum pillbox. The cycle is: form all over, drill, tap, then cut off the screw cap; drill pillbox body remaining on rod, thread OD, knurl and letter stamp, cut off.

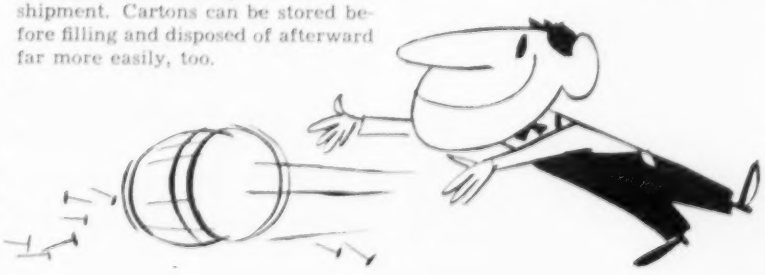
The Old Supervisor Speaks

I've handled a pick and a shovel,
I've sat on a bench in my time,
I've done heavy work in the heat and the murk,
I've known all the sweat and the grime;
And so, when some frosty-eyed expert
Talks "Labor" as if it were coal—
"A commodity"—well, I just choke for a spell,
Before I regain my control.

Now maybe I'm mossbacked and rusty
But here's how it lines up to me;
Statistics will aid in the plans you have made,
They're useful to quite a degree,
But all of your lore scientific
Will fall down again and again
Unless in your brain this one fact you retain,
That "Labor" means flesh-and-blood men.

In brief, it's a problem that's human,
No soulless "commodity" stuff,
And the very best plan I have happened to scan
Is just to be human enough;
And when it is finally settled
(I fear I won't be here by then)
It won't be by art of a book or a chart,
But *MEN DEALING FAIRLY WITH MEN.*

Anonymous



News of Metalworking . . .

CHEMICAL MILLING: 20,000 Parts Are

LOS ANGELES — What's going on in chemical milling these days? Have any new uses for it been developed in recent months? Where do you get the chemicals for the deep-etch process, and do you need a license? What metals can be chem-milled? With interest in the process growing fast in Metalworking plants coast to coast, those are some of the questions that pop up most frequently.

The answers are to be found out here on the West Coast, where North American Aviation invented chemical milling a couple of years back (*AM*—Sept. 13 '54, p200). Since then, North American, through its agent, has sub-licensed the process to almost 90% of all major U S airframe builders, and to many of the smaller firms who produce parts for airframe manufacturers. North American recently was issued such a broad patent on the chemical-milling process that one of two major aircraft holdouts, Convair, immediately opened negotiations with Turco to become a sub-licensee.

Chemical milling is a variant of the engraving process applied to metalworking (surface etching of metals, using acids or alkalis instead of cutting tools). It is designed as a supplement to machining, not, despite its name, as a replacement for the milling machine, which can accomplish many jobs more economically than chemical milling.

A Mil a Minute

But chemical milling, on the other hand, can do several things that milling machines can't, such as removal of metal from irregular surfaces, and at a rate of a mil a minute.

At the moment, chemical milling is in the production stage on aluminum only—with a strong alkali as the etchant. North American's Columbus plant has also developed an HCl etch for aluminum. Development of the process for steel, magnesium, and titanium is still in the experimental stage. Dow Chemical and Turco are working together to develop the etchant for magnesium, and Turco will license the process eventually.

Development of etchants for aluminum and steel isn't hampered by hydrogen embrittlement, but it's a major problem with titanium.

The Acid Problem

Biggest over-all problem, one that applies to all metals, is to come up with a reasonably priced acid bath that will hold up for the required length of time, and that can be rejuvenated after so many hours of chemical milling. Temperature of the bath is important (150 to 190 F), too: so is the amount of acid in the bath—in holding to the necessary tolerances. But one simplifying factor in the process is that the same-strength solution applies

New Glass-Powder-Mold Precision Casting

Into the slurry . . . of Glascast goes the wax pattern. Slurry has additives that insure close adhesion to the pattern

Assembly is coated with coarse Glascast grains . . . before the slurry has dried. Then the assembly is dried at room temperature, re-dipped and re-coated again and again until the disposable glass mold achieves the desired thickness — ⅛ to ¼ in.

Flying—with More on the Way

to all aluminum alloys. You don't have to vary the concentration for 24ST, or 75ST. Masking is still a problem, too, on aluminum parts. In one case, 15 coats of maskant were required.

Costwise, one West Coast airframe maker tallied the amount of production possible with a $200,000 milling machine and a $200,000 chemical milling facility (cleaning tanks, etching tanks, spray booths for maskants, heating equipment) and found out that the chem-milling unit could turn out more pieces in a given time. And by kicking in $10,000 for more etching tanks for the $200,000 chem-mill setup, the company found it could double the installation's output.

By either the North American-Turco process or another planemaker's self-developed "deep etching" process, the etching rate for aluminum is 1 mil per min. One airframe maker is currently etching between 10 and 20 production parts for jet transports, guided missiles, and fighters. Throughout the entire aircraft industry, it's estimated that some 20,000 chem-milled parts are flying around in planes.

What Does It Cost?

What does chemical milling cost? Turco says it takes 50¢ worth of chemicals to remove 1 lb of aluminum. This doesn't include labor costs, or money spent for equipment, cleaners and maskants. Because of the wide variance in the amount of maskant needed for any given job, Turco declines to give any estimated average figure for the overall cost of chem-milling any part.

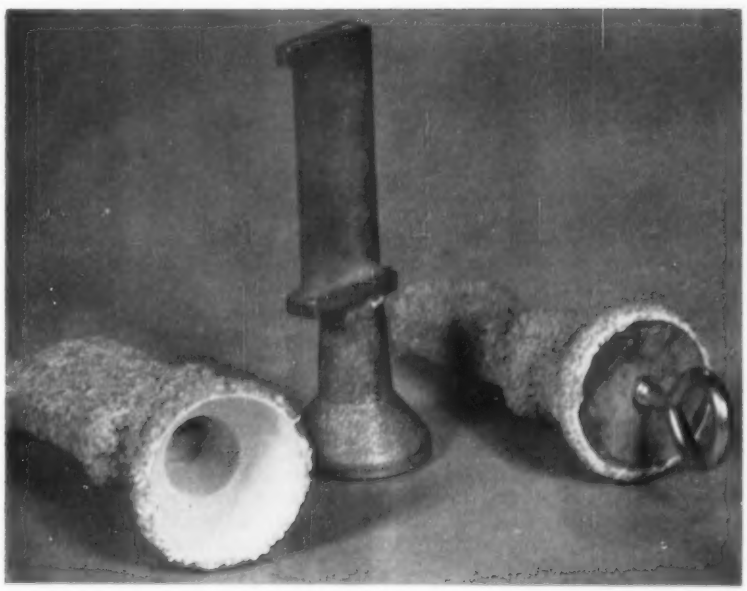
Autodom's Watchful Waiting

That's one reason why the automotive industry to date hasn't gone into chemical milling to anywhere near the degree that the aircraft industry has. The auto people operate closer to the cash register than do the plane people: they want definite dollars and cents estimates on what it will cost to chem-mill a given part —something Turco thus far finds it impossible to provide.

But the auto people are interested in the possibilities of chemical milling. So are the shipbuilders, what with aluminum superstructures gaining widespread acceptance. The home-appliance industry is taking a more-than-casual look at chemical milling because of its de-burring possibilities.

Actually, North American and Turco aren't anxious to gain much acceptance for chemical milling in new metalworking fields. They feel they have more sub-licensing work in the West Coast aircraft industry alone than they can handle. In fact, eastern airframe makers have complained that they can't get chem-milled aircraft parts locally, have to come out West to get them.

Process Eliminates Knockout, Investment Materials



High surface finish, close tolerances . . .
are achieved by the Glascast process. At right is mold assembly before firing and dewaxing; at left, after firing. Casting (center) can be poured at temperatures to 3300 F, requires no knockout, takes 24 hr from start to finish

CORNING, N Y — Corning Glass Works has come up with a new precision casting technique, similar to the lost-wax process except that (1) it uses one-piece glass powder molds, and (2) it eliminates all need for investment material, dewaxing ovens, and knockout.

It works this way: wax pattern is dipped into a Glascast (glass powder) slurry, coated with coarser glass powder grains, dried, re-dipped and coated several times to build up the mold shell, fired (with wax pattern removed simultaneously). Mold is then ready for casting, requires no further treatment.

20-40 Mu-In. Finish

Developed for casting precision parts from high-temperature alloys, the processes withstand tremendous heats, and yield blemish-free castings with surface finishes of 20 to 40 mu in. Mold material's low thermal expansion, plus absence of firing shrinkage in molds, readily achieves tolerances of ±0.005 in. After casting, the Glascast mold cracks off easily and cleanly.

Canada's Aircraft Industry Is Humming

From single-engined monoplanes for the Far North's bush pilots to fast jet interceptors for NATO, Canada's three top aircraft makers are turning out planes full blast these days. Just 10 years ago, Canada made airframes but no engines. Today, the products of A V Roe Canada Ltd (CF-100 all-weather interceptors), Canadair Ltd (Sabre IV, powered by Canadian-built Orenda engines), and DeHavilland Aircraft of Canada (Beaver and Otter "Flying Workhorses") are flying military and commercial assignments in some 28 countries. Left: final assembly of T-38 Silver Star jet trainers at Canadair's Montreal plant. Right: CF-100's await jet engines at Avro's Malton, Ont, plant

Automation Hits British Headlines

LONDON—The bogeyman of mass unemployment through automation, pretty effectively disproved in the United States last year, has showed up in England in recent weeks, touching off an explosion of scare talk in the House of Commons—and England's first strike over replacement of workers by automated equipment.

It all started April 26, when Standard Motor Co of Coventry installed several automatic transfer machines for tractor production, promptly announced that the resulting "reorganization of tractor production" would mean the temporary laying-off of some 3000 workers. Immediately, the plant's 11,000 production workers walked out. It wasn't the first introduction of automated machines into British industry, nor was it the only installation of automatic transfer machines at Standard. But the other machines had been installed piecemeal during times of rising production. This time, Standard was installing machines on a large scale in the face of declining automotive output.

The Communists regard this as meat and drink, of course. One of them, W Warman, chairman of Standard's Joint Shop Steward's Committee, called the strike immediately, without sanction of the Trades Union Congress, and before Standard had time to arrange compensatory payments to tide the 3000 laid-off workers over.

Eden Gets into the Act

The national furore raised by the automation-vs-unemployment scare sent Coventry's Labor MP into the House of Commons with fire in his eye. What, he demanded of Prime Minister Eden, did the government propose to do about the effects of automation on employment? And would the government do anything to stop industry from buying machines that throw men out of work?

Sir Anthony rose to the occasion. In a speech before the Conference of Scottish Unionist Associations in Perth May 11, he said, "We must not be afraid of change, even when it is given a frightening name like 'automation.' Our only fear should be that we shall not modernize ourselves quickly enough to hold our position in the markets of the world —that is where the real danger of unemployment lies."

Automation, he added, brings with it very real problems for industry and for the nation. It is the duty of both management and labor to get together to overcome them, as quickly as possible, to make the transition a smooth one, Mr Eden said.

In answer to the Coventry Labor MP's question as to whether the government had made any attempt to study the effects of automation on employment, Mr Eden cited a 106-page report *"Automation,"* published by the government-sponsored Department of Scientific and Industrial Research. The booklet is designed to show automation's impact on production methods, national output, and international trade.

Advocate Slow Changeover

Says the report: "Automation is likely to create serious problems, most of them common to all forms of technical advance, and industry must solve them if automatic processes are to spread widely without the social and economic dislocation that marred the early history of the Industrial Revolution."

Unemployment is unlikely to become a serious problem if it is not introduced too rapidly, the report says, and Britain's current shortage

of technologists is good insurance against that.

Firms, says the report, can keep redundancies to a minimum by good managerial practice—in other words, by quickly absorbing laid-off workers into other jobs.

It is going to be a tough job for management to persuade workers and labor to make the switch to new skills required in an automated age, the reports says. It will be hard to make them accept the necessary around-the-clock shift work (more so in Britain than in the U S), and to make them retain their interest in a job without the social contact that exists within teams of production workers. Such problems, says the report, will be greatly eased "if due attention is given to the needs, feelings and problems of the workers concerned, and if the trade unions are consulted in advance of each step."

Just what is the attitude of British labor toward automation? Britain's Trades Union Congress as a whole takes a broad view, as witness an article in its journal, "Labor," for April:

The article is titled, "Ludd is Long Dead—Now We Take a Stand for Plenty" (Ned Ludd was the leader of a group of workers who attacked and destroyed machines at the beginning of the 19th Century.)

It says, "The age of automation and atomic energy can be made a time of prosperity for all in the nation—if we go about it in the right way."

Pentagon to Step Up Hard Goods Buying

WASHINGTON—The Defense Dept is taking another "new look" at the size and makeup of U S military forces. Pentagon planners are making an audit of current strategic policies, are trying to project military requirements three to four years ahead. The general decision is to continue to rely on the deterrence of nuclear airpower. While defense expenditures and the size of military forces will be kept at present levels, procurement of hard goods and production equipment will creep upward.

Again: "The New Look"

The inquiry now under way goes far beyond the preliminary budget preparations the Defense Dept normally starts this time of year. It is being conducted along the same far-reaching lines as the Eisenhower administration's "New Look" of 1953. At that time, policy was shifted from a military buildup aimed at a specific date of maximum danger to a stable mobilization program geared for the "long haul." In addition, new emphasis was placed on the deterrent power of the Strategic Air Command.

The newest new look began in March when the Joint Chiefs of Staff flew down to Puerto Rico for what Defense Secretary Wilson called a "realistic reappraisal" of military policy. The JCS decided that, barring a major change in the international situation, the current, military program is "adequate."

Translating this conclusion into terms of long-range defense expenditures, the military budget outlook shapes up this way:

Despite the talk of stability in spending, total expenditures will inch up slowly over the next few years—from $35.1 billion this year (initial estimates were $34 billion, later $34.5 billion) to at least $35.7 billion in fiscal 1957, and probably over $36 billion in fiscal 1958.

Up to now, Pentagon officials have spoken about a $35 billion spending level for the indefinite future—"give or take a billion." It's now clear all the changes will be on the "give" side. Says one Defense Dept spokesman: "We have increased defense costs even with a level-off program, mainly because of higher equipment costs."

Major hardware procurement will total $11.8 billion in fiscal 1956 and rise slightly next year. The trend will continue as more guided missiles move out of the development stage and into heavy-volume production. Navy spending, in particular, is likely to increase—larger numbers of "Forrestal"-class aircraft carriers and nuclear vessels will be coming off the ways: more conventional ships will be converted for guided missile operations. The Air Force's speed-up of B-52 output is also likely to boost expenditures over the next two to three years.

Capital Spending to Rise

Procurement of production equipment is slated to go up slightly, too. This year's total (which includes a minor amount of new plant construction) will be $363 million; next year's will be $375 million. An important prop will be the Defense Dept's new program for replacement and modernization of machine tools.

JCS's restatement of military policy is pretty much a middle of the road position. It falls between (1) the heated demand from some Democrats in Congress to step-up the defense program, and (2) the quiet proposals both here and abroad for cutbacks in U S military forces to take the sting out of Soviet disarmament talk.

Meantime, the House has voted a $33.6 billion appropriation for the Defense Dept for fiscal 1957. The administration's budget called for $34.1 billion in new money; the difference was more a matter of bookkeeping manipulations rather than a cutback.

The house denied the reappropriation of $100 million for reserve tools and facilities. Said the House Appropriations Committee report: "In view of the changed policy of the department to integrate such tools in the current production programs, the services should use their available procurement funds for the purchase of needed tools. Each of the three services has the authority to do so."

FORD ENTERS GUIDED MISSILES FIELD

LOS ANGELES—Ford Motor Co has formed a new subsidiary, Aeronutronics Systems Inc, for entrance into the missiles systems field. Nucleus of the new firm, which will be temporarily located here, is a group of ex-Lockheed scientists who have been operating as Systems Research Corp. Aeronutronics will develop and eventually produce weapons systems for the military and related electronics systems for commercial use. Within the broad scope of future projects: systems for exploring outer space.

East...

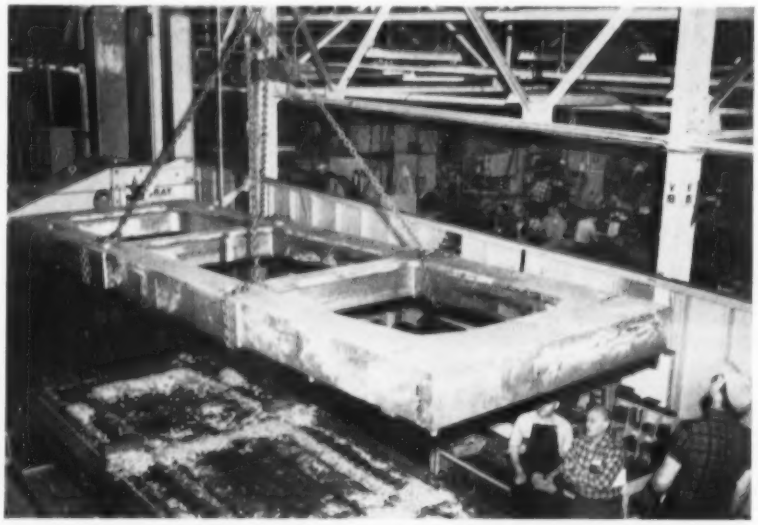
Around the East . . .

H K Porter Co's shifting of its tool steel production from its **Henry Disston Division,** Philadelphia, to it's **Vulcan Crucible Steel Division,** Aliquippa, Pa, plus the closing down of its **Armor Plate Division,** will result in the dismissal of several hundred of Porter's 1500 Philadelphia area employees within the next several months . . . Pennsylvania coal area communities have raised upwards of $8 million to finance inducement of some 59 industrial plants into the region. The 14 communities, including Wilkes-Barre and Scranton, have created 11,899 jobs in this labor-distress area . . . **Pittsburgh Coke & Chemical Co** has formed **Neville Ferro Alloy Co** at Pittsburgh to produce and market ferro-manganese, and other ferro-alloys . . . **Fischer & Porter Co,** Hatboro, Pa, has broken ground for a $1-million office building there . . . **Chicago Pneumatic Tool Co** has acquired **Allen Mfg Co,** Hartford, Conn, maker of Allen Head set screws and cap screws, will make it a subsidiary. Personnel, products, and location remain unchanged . . . **Titanium Metals Corp of America,** New York, has cut the price of titanium sponge 20¢ per lb to $3.25, and has lowered prices of its titanium mill products about 6% . . . **Aluminum Co of America** says its expansion plans for the next five years may cost as much as $600 million . . . **C H Wheeler Mfg Co,** Ambler, Pa, has renamed its Cruse-Kemper Division **Wheelerweld** . . . **Olin Mathieson Chemical Corp's** Metals Division has cut prices of brass strip, sheet and scrap from 1¢ to 1½¢ per lb, reflecting the recent cuts in per-pound costs of copper . . . **Rockbar Corp,** electronics equipment distributor, has moved into new, larger quarters at 650 Halstead Ave, Mamaroneck, N Y . . . **Lewyt Corp** is moving its three Brooklyn plants into a single six-story building at 43-22 Queens St, Long Island City, N Y . . . **Electric Auto-Lite Co** has bought out **Reading Batteries Inc,** Reading, Pa, will make it its Reading Batteries Division . . . **Arwood Precision Casting Corp, Brooklyn,** is moving its executive offices to 321 W 44th St, New York City . . . **General Electric's** Medium Steam Turbine, Generator and Gear Dept will spend $23 million on expansion and modernization in the next five year. Outlay calls for new buildings, equipment and manufacturing methods . . . **General Ultrasonics Co,** Hartford, Conn, is moving into a bigger plant at 67 Mulberry St, Hartford . . . **Loewy-Hydropress,** division of Baldwin-Lima-Hamilton, New York, has an order from **Calumet & Hecla** to build a 3000-ton, water-hydraulic extrusion press for extruding brass and copper tubing at C & H's Detroit plant . . . **duPont** previewed it Teflon automobile suspension joint in New York May 10. duPont claims it'll eliminate the need for conventional lubrication in many types of bearings . . . Four-months-old **New England Tubular Rivet Inc,** Milford, Conn, is already moving into bigger quarters at 97 Buckingham Rd, Milford.

South...

Dixie Newbriefs . . .

Lockheed Marietta's safety-record-breaking team, Dept 21-13, is still piling in the no-lost-time-through-accident hours. At last count: well over 3-million manhours . . . **Radioplane Co,** Northrop Aircraft's target drone aircraft manufacturing subsidiary, was officially opened in El Paso, Texas, May 11 . . . **Dresser Industries Inc,** Dallas, lost out on its proposed deal to get Russian turbodrills in exchange for information on how to make alloy steel drilling bits, when the Commerce Dept turned thumbs down on the deal. Dresser officials are hopping mad over the decision, but will abide by it . . . **Babcock & Wilcox Co's** Nuclear Facilities Plant has started fabrication of nuclear fuel elements, and experiments on reactor core components at Lynchburg, Va . . . Two pilot models of the "South's No. 1 Vertical Mill," first basic machine tool to come out of the South on a production basis, were shown at Atlanta's **First International Industrial Exposition** May 18-25. The 3000-lb mills are the work of the six-year-old **Southeastern Engineering & Mfg Co** . . . Speaking of Atlanta, between January 1 and April 30, 26 new manufacturing plants were set up there, plus branch offices and warehouses for 31 more out-of-town firms . . . **Carolina Aluminum Co,** Badin, N C, is sweating out a Federal Power Commission OK to build a fourth dam on the Yadkin River. Once the dam is built, the plant will be modernized at an estimated cost of $20



Biggest Aluminum Castings for B-52's

SAID TO BE THE LARGEST EVER PRODUCED, aluminum castings like this one, an end gate for the jig that cradles aircraft wing components, are being turned out at Boeing Airplane Co's Seattle and Renton, Wash, plants to aid in output of B-52 Stratofortresses and KC-135 jet tankers. End-gate casting shown here is 14 ft high, 5 ft wide, 1 ft thick, weighs 5400 lb and contains more than 30 cu ft of aluminum

Field Report USA:

Vacuum Caster

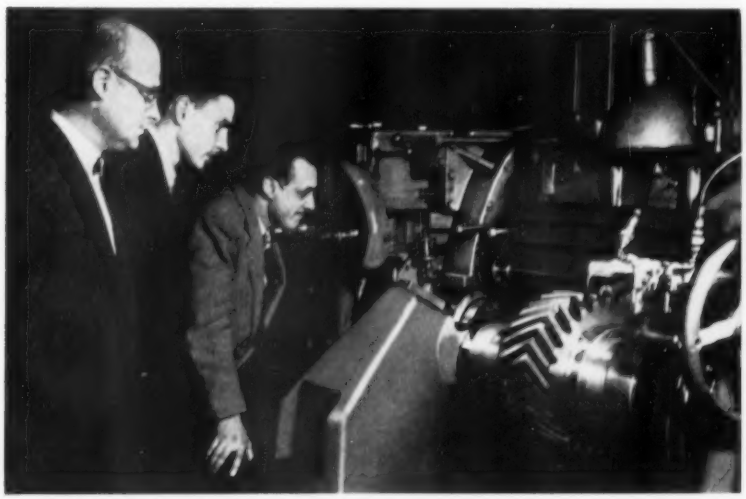
SAID TO BE AMERICA'S FIRST, this airtight chamber will be used by U S Steel's Duquesne (Pa) Works to vacuum cast large forging ingots. The moveable chamber is 31 ft high, 17 ft in diameter

million, and output will be upped from 70 million lbs a year to 100 million . . . **Lockheed Aircraft** is taking over **Fairchild Engine & Aircraft's** just-closed St Augustine, Fla, offices, has absorbed most of the 33 engineers employed there . . . Houston, Texas, has seen inrush of $2.8 billion worth of new construction, more than half of it industrial and commercial, since WW II . . . **General Electric's** Rectifier Dept, currently headquartered in Lynn, Mass, will move to Lynchburg, Va, when a 200,000-sq-ft plant is completed early next spring. It'll employ 1000 . . . **CIT Corp,** machinery and equipment financiers, have established a branch office in Dallas, Texas.

West . . .

Around the West . . .

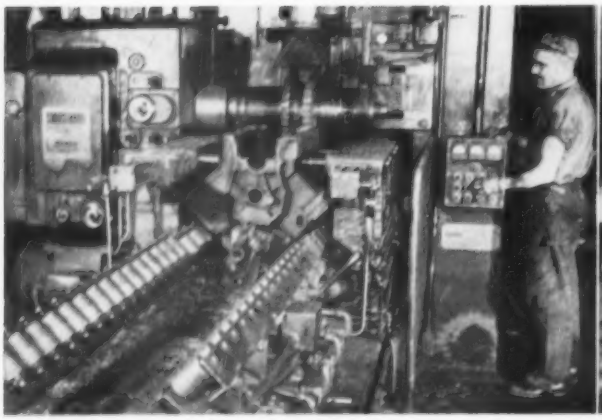
Food Machinery & Chemical Corp has a new $25-million Army Ordnance contract to manufacture "several hundred" armored amphibious tracked vehicles, with first deliveries of the M84 slated for next January. The company will deliver its first M59s this October. The new order boosts FM & CC's backlog to $66.3 million . . . In the race to get out new transports, both **Douglas** and **Lockheed** are readying for heavy output on the Douglas jet DC-8 and the Lockheed turboprop Electra—both a year or two away from production. Douglas is tooling up on a large scale at its main plant. So is Lockheed . . . The West is a growing market for grinding wheels—a good barometer of metalworking business. **Norton Co's** newly opened Santa Clara, Calif, plant is already working at capacity . . . San Francisco Bay area tool and die shops report business has picked up as much as 20% in the last six months, claim outlook is rosy—particularly with big new customers like **Lockheed's** missiles facility, an **IBM** plant, and a **Buick-Olds-Pontiac** assembly plant coming into the area . . . **Northrop Aircraft** has been awarded an Air Force contract to produce supersonic jet trainers, long on the drawing boards of Northrop. They'll be made at the main Hawthorne, Calif, plant . . . **North American** has a multi-million-dollar order from the Air Force for two-seater versions of the Super Sabre, to serve as jet fighter-bombers, air-superiority fighters, or trainers. North American, incidentally, has started work on a new 300,000-sq-ft headquarters manufacturing and office facility at Downey, Calif. It'll make computers and aircraft fire control systems there . . . **Airline Welding Engineering** will soon start work on a $100,000 building in Los Angeles, where it'll consolidate specialized welding and welding manufacturing facilities, formerly in two separate buildings . . . **General Metals Corp's** Foundry & Forge Division is consolidating its offices in a new building adjoining its Oakland plant . . . **Kaiser Steel Corp** will spend $113 million in expanding its Fontana, Calif, steel mill. It'll mean a 40% increase in output of ingot and finished steel, is slated for early 1958 completion . . . **Kaiser Steel's** tremendous recently announced expansion program will tie Kaiser for top steel producer in the West with Columbia-Geneva, will make it bigger than Bethlehem Pacific. Here's how Kaiser will finance its expansion: $13 million from earnings, $70 million from first mortgage bonds, $30 million from promissory notes. Because auto output isn't a big factor on the West Coast, the auto slump shouldn't affect steel output here, according to recent estimates by Kaiser officials.



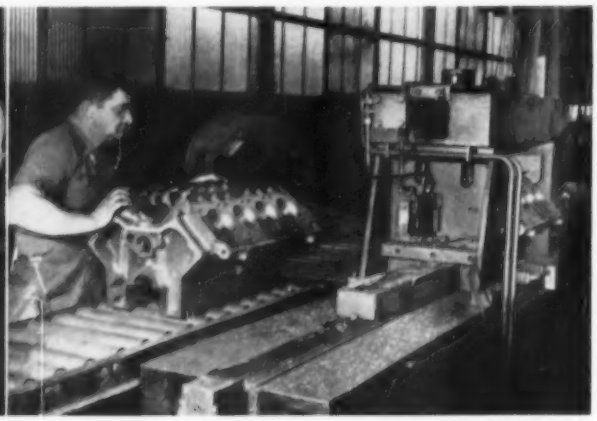
French Students Learn U S Gearmaking

TWO FRENCH EXCHANGE STUDENTS, of 14 spending a year in the United States under sponsorship of the International Association of Machinists, were recent guests of Chicago's Industrial Gear Mfg Co, where they not only witnessed U S gear manufacturing mehods, but were given an insight into the management and labor relations policies that make the company tick. Shown are: John A Sizer, left, president of Industrial Gear, Daniel Baldensperger of Seine, France, and Jacques Genet of Paris

Field Report USA:



Sundstrand mill has two spindles . . .
that rough mill pan rail and main bearing surfaces on block castings in one pass. Conveyor rollers facilitate movement of part to next station—after two reference holes are drilled at machine's final station (they locate the casting in subsequent operations)



Detroit broach takes just one pass . . .
of its broach bar to finish main bearing seats in a V-8 block. This Model 10-56 horizontal pull machine has hydraulically actuated pins that locate part under power clamps. Machine's table is level with conveyor to facilitate manual loading across flush section of cutter bar

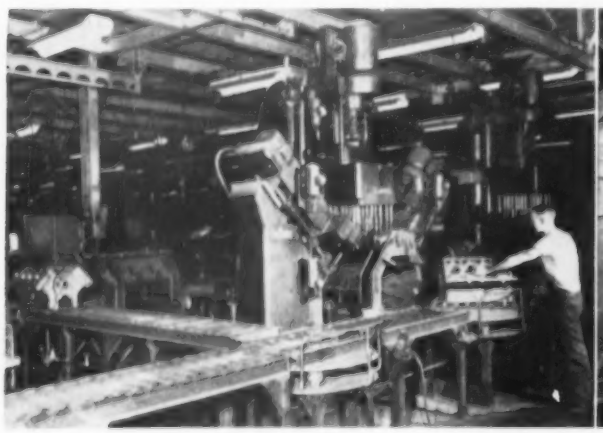
IHC Combines Manual Transfer With Automation

Midwest...

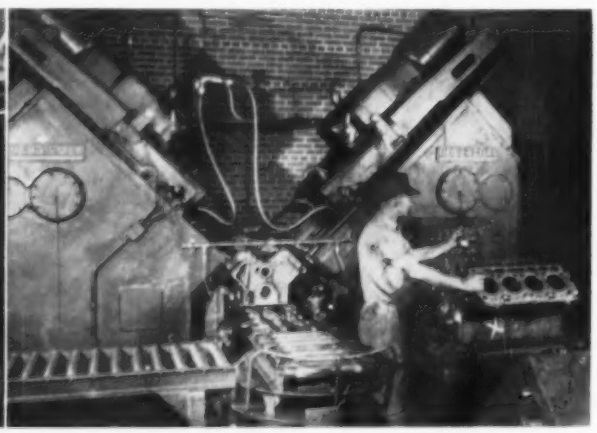
INDIANAPOLIS—International Harvester is steering a course midway between job-lot production methods and automated transfer lines to produce three sizes of heavy-duty V-8 gasoline engines for motor trucks at its Motor Truck Division engine plant here. Not only that, Harvester has integrated V-8 manufacture with production of 6-cylinder inline engines.

Wherever necessary, multi-spindle, automatic-cycle machine tools are employed. But transfer of workpieces from machine to machine in most cases is done manually along roller conveyors. And where machine capacity is greater than is needed, the machine is usually called upon to do several different operations. For example, one single-spindle machine performs all milling operations on bearing caps, with cutter arbor setups and workholding fixtures changed between operations.

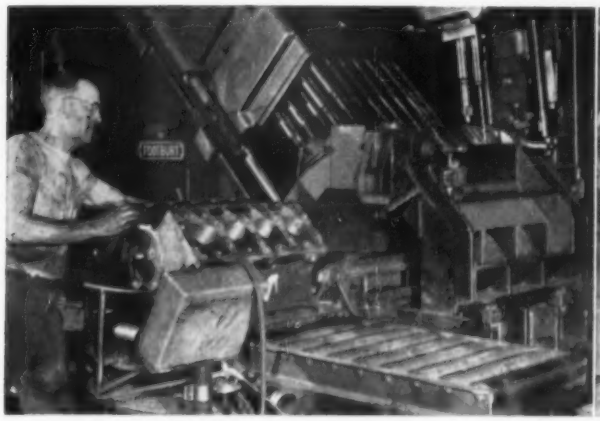
An outstanding example of what can be done in middle-ground automation of a machining line is the new setup at the Indianapolis plant



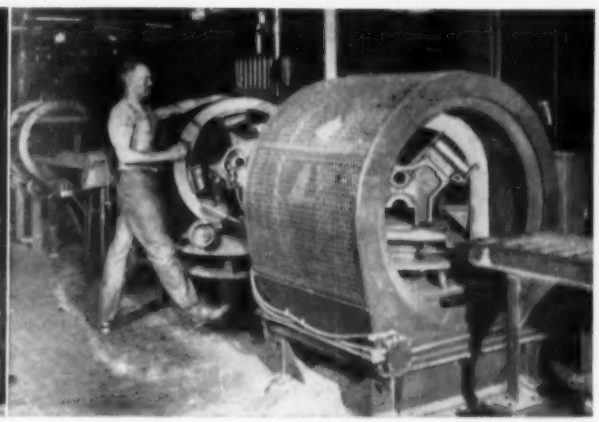
One of several inspection stations . . .
located on conveyor spurs alongside critical machining operations. In most cases, these inspections are made on a sampling quality control basis. But 100% inspection is specified after some operations



Ingersoll unit finish machines . . .
all eight cylinder bores simultaneously to insure accurate spacing and alignment. Machine cycle is automatic, to give operator time to service other units in the line



Footburt drill does "turnaround" machining . . . of one side of a casting at a time — cutting capital investment while providing cost-cutting features of multi-spindle heads. Ordinarily, machine fixtures in a block line have power loaders that move part in and out of fixture in an automatic cycle



Harvester-developed chip shaker . . . is power-operated, of the turnover type, and is equipped with an air vibrator to shake out the chips while the casting is rotated through 360 degrees. Two of these units are used in International Harvester's engine block line at Indianapolis

to Machine Cylinder Blocks for V-8 Trucks

for finishing V-8 cylinder block castings. Here, some 15 production workers use 41 machines to turn 300-lb alloy castings into precision-finished blocks ready for the assembly line. Some of the important features of this line are shown in the accompanying photographs.

Other novel installations used to make parts for the V-8 engines include:

- Chasing of threads on ends of SAE 1055 forged steel camshafts with a Cri-Dan lathe has proven more economical than the thread grinding operations used on camshafts for 6-cylinder engines.
- Except for one operation, milling is used instead of broaching in machining V-8 engine connecting rods. And a novel electronically controlled Snyder miller is used to machine these rods to a single weight specification at both ends.
- Oil holes in crankshafts are drilled in unusual Avey machines which support the workpieces vertically instead of horizontally, as is the usual practice. This saves badly-needed floorspace.
- Flywheels, as well as crankshafts, are balanced dynamically—to help eliminate need for dynamic balancing of the engine after assembly.

Harvester's middle-ground automation is the end-result of the company's need to produce V-8 engine parts at costs competitive with similar engines produced on the highly mechanized engine lines of major automobile makers. Harvester's engines must achieve the same high standards of precision and performance, but at a lower cost per engine.

Proof that Harvester has been successful with its middle-ground automation can be found in the six-cylinder engines it turns out at Indianapolis. The result of seven years' research, these engines (weighing from 4.3 to 5.3 lb per hp, with 206 to 257 maximum hp ratings) provide higher horsepower and greater torque than other inline engines of equal size, and have stood up extremely well under more than 3-million miles of test track driving under user operating conditions.

The rest of the Midwest . . .

American Can Co will spend $1 million to convert a leased Detroit plant to manufacture of beer and soft drink containers. It'll have high speed lines that can turn out 450 cans a minute—160 million a year . . . **Long Mfg Division of Borg-Warner** is completing a $1 million modernization program at its Detroit plant . . . **Sheffield Corp**, Dayton, Ohio, recently held a one-day gage clinic for quality control people from 14 **General Electric** plants . . . **Dreis & Krump Mfg Co** has just shipped its 100,000th hand bending brake . . . **General Motors** is delaying building of its big Fisher Body-Chevrolet assembly plant at Lordstown, Ohio, for six months because of "revised engineering specifications" . . . Foote-Burt Co, Cleveland machine tool builder, has taken over Cleveland Transit System's old St Clair Station, will use it for "future expansion" . . . **Chrysler Corp** has set up a new 19-plant Stamping and General Manufacturing Group, which incorporates the Automotive Body Division, formed around the old Briggs Mfg Co facilities in 1953. The Group will have two divisions, Stamping, and Parts and Equipment Manufacturing. Stamping has 16 plants (14 in Detroit, one each in Indiana and Ohio): Parts & Equipment has three (two in Detroit, including the Highland Park plant, and one in Ohio) . . . **Doehler-Jarvis** will expand its Plant 2, Toledo, at a cost of $1.06 million . . . **Ford** has purchased a 38-acre tract at Delair, N J, will build a 389,000-sq-ft parts depot and export vehicle facility there . . . Westinghouse has tremendous plans for building new appliance lines and expanding old ones at its Columbus, Ohio plant . . . **Westinghouse Air Brake's Le Roi Divison** will spend $5.5 million in the next 5 years.

Walter W Tangeman (see below)

Swan E Bergstrom (see below)

William E Rudel has been appointed executive vice president of the Rudel Machinery Co, New York machine tool distributors

Names in the News . . .

Walter W Tangeman, executive vice president of The Cincinnati Milling Machine Co since 1934, has been elected chairman of the board. **Swan E Bergstrom,** who has been vice president since 1949 and manager of the Machine Tool Division since 1954, has succeeded Mr Tangeman as executive vice president.

Mr Tangeman, a native Cincinnatian, is now in his 48th year with Cincinnati Milling, having joined the company in 1908 as a cooperative engineering student. Through the years he has served in various manufacturing, sales and engineering capacities and has been a member of the board of directors since 1927. He is a past president of the National Machine Tool Builders' Association and is a member of the executive committee of the Machinery & Allied Products Institute. He was a member of the second Hoover Commission and has been a member of several government advisory committees. He is president of the University of Cincinnati Research Foundation and member of the board of directors of Wilmington College, Wilmington, Ohio.

Mr Bergstrom is a native of North Dakota, studied electrical engineering at Purdue, worked as tool designer and chief tool engineer in automobile plants, and in 1927 joined Cincinnati Milling. He became manager of the Detroit office in 1931 and seven years later was appointed assistant sales manager of the company. In 1942 he was made chief engineer of armament production and successively became sales manager, vice president and director. In 1951 he served as director of the Metalworking Equipment Division of the National Production Authority and the following year was elected president of the National Machine Tool Builders' Association.

Frederick V Geier continues as president of Cincinnati Milling.

Charles L Holbert, a vice president of H K Porter Co, Pittsburgh, has been appointed executive vice president. He succeeds **Clarence R Dobson,** who has retired from active duty but will serve as a consultant.

H D McLeese, general sales manager of Metal & Thermit Corp, New York, has been elected a vice president. He will continue to act as the company's chief sales executive.

Herman F Zorn, sales engineer in the Schenectady, NY, area for Rudel Machinery Co, has been appointed a vice president of the company.

Julien R Steelman (left) is president of Koehring Co, Milwaukee manufacturer of construction machinery, which has acquired Hydraulic Press Manufacturing Co, Mount Gilead, Ohio. **G B Robinson,** H-P-M board chairman, continues in that capacity, and will become a member of the Koehring board of directors. Merger is scheduled for completion by the end of June

Eduard Baruch, executive vice president of Heli-Coil Corp, Danbury, Conn, has been appointed president. He succeeds **Louis R Ripley,** named board chairman. **Walter Mann** takes over Mr Baruch's former duties

Edward P Gillane (see below)

J Potter Cunningham (see below)

David J Munroe, executive vice president of Webster Electric Co, Racine, Wis, has been named president. He succeeds **Preston G Crewe,** elected vice chairman of the board

Edward P Gillane has been elected executive vice president and a director of Pratt & Whitney Co, Inc, West Hartford, Conn. He has been associated since 1948 with the Potter & Johnston Co, Pawtucket, RI, Pratt & Whitney subsidiary, first as vice president and controller, then as general manager, and finally as president as well as general manager. Mr Gillane previously had been with the Underwood Corp for more than 27 years.

J Potter Cunningham has become president of Potter & Johnston as successor to Mr Gillane. He has been connected with the company since 1915 and had been vice president and sales manager since 1938.

John L McCaffrey, president of International Harvester Co, Chicago, has been elected chairman of the board. He will continue to act as chief executive officer of the company. **Peter V Moulder,** an executive vice president, has been elected president. **Frank W Jenks,** vice president in charge of merchandising services, and **Harry O Bercher,** vice president in charge of the company's Wisconsin Steel Division, have been named executive vice presidents.

William C Westbrook has been elected chairman of the board of Noble & Westbrook Manufacturing Co, East Hartford, Conn, maker of metal marking equipment. **G Edgar Westbrook** has been named president, and **Howard B Noble** vice president and treasurer.

John R Titlow has been elected vice president of Lamson Mobilift Corp, Portland, Ore. He will continue to serve as manager of sales and service.

Kenneth E Anderson has been named general plant manager of Borg-Warner Corp's Norge Division operations at Muskegon and Muskegon Heights, Mich. Previously factory manager at Muskegon Heights, Mr Anderson replaces **Charles W Martin,** who has resigned.

Kenneth V Lutz, general sales manager of All-State Welding Alloys Co, White Plains, NY, has been elected vice president, sales.

H K Woodward, general industrial sales manager for Briggs Filtration Co, Washington, DC, has been promoted to general sales manager.

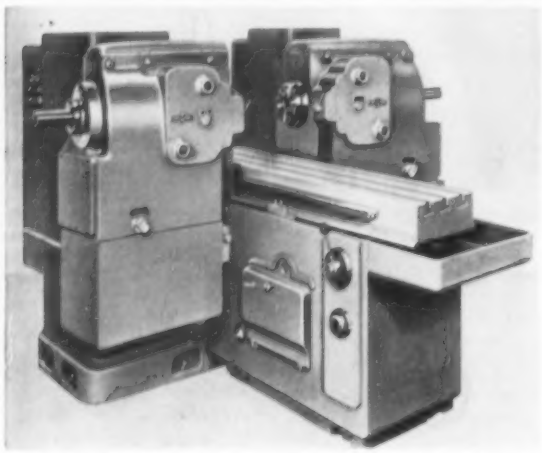
A E Hill, chief tool engineer at Convair (San Diego), a Division of General Dynamics Corp, has been named works manager of Plant I. **R W Peters,** assistant to Mr Hill for the past two years, succeeds him.

Lloyd J Ely, manager of Caterpillar Tractor Co's Peoria, Ill, plant, has been named director of manufacturing for the company's seven domestic facilities

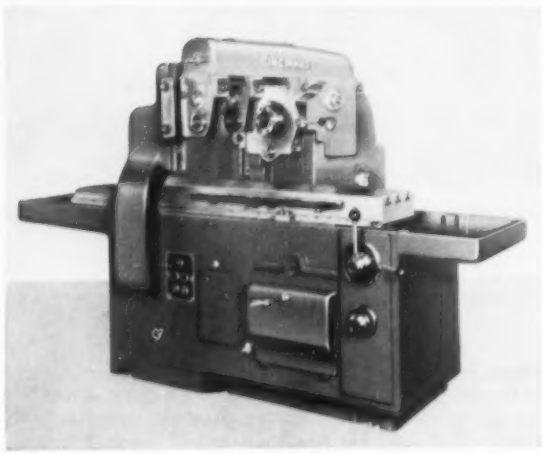
James E Barnes, sales engineer for Buhr Machine Tool Co, Ann Arbor, Mich, has been promoted to sales manager of the company.

Douglas Swanson, sales engineer for Swanson Tool & Machine Products, Erie, Penna, has been appointed vice president and manager of sales engineering

New Shop Equipment,



DUPLEX-STYLE MACHINE has automatic cycles for the table only. Spindle carriers remain fixed in relation to table traverse



PLAIN RISE-AND-FALL POWERMATIC is designed for milling closed-end cuts, and those requiring cutter retraction to clear obstruction in work or fixture. Both table and spindle carrier have automatic cycles

Cincinnati Powermatic Millers

Line of automatic milling machines identified as Powermatics is built in plain, duplex, and plain rise-and-fall styles. Much heavier and more powerful than superseded models, machines offer increased cutting capacity (up to 10 hp) and higher spindle speeds (up to 3000 rpm) for taking conventional milling or climbing cuts with either high-speed steel or sintered-carbide milling cutters.

Standard Powermatics, designated the 200 Series, are built in seven sizes of each style, from No. 205-112 (24-in. table travel, 5 hp) to 210-118 (96-in. table travel, 10 hp).

Through a cycle selector unit, a single lever initiates the complete milling operation, including automatic table cycle, automatic spindle stop, automatic backlash eliminator, automatic spindle-carrier cycle of rise-and-fall machines, and automatic spindle retraction when this equipment is supplied. To aid in setting up machine, all automatic features can be bypassed for manual control.

Walls of the bed are considerably wider than the table, and the intervening space serves to catch the coolant and chips. Table is traversed through a screw-and-nut arrangement, and powered by a separate 2-hp motor mounted on hinged rails in the bed.

Standard automatic table cycles feed to the right or left, or alternately right and left, with rapid traverse at rate of 300 ipm. Sixteen table feeds, ranging from ½ to 20 ipm, are obtained with change gears. Sixteen spindle speeds can be obtained through change gears and a back-gear combination. Choice of three ranges of spindle speeds is offered: 75 to 3000 rpm, 50 to 2000 rpm, and 30 to 1200 rpm.

On rise-and-fall machines, vertical feeds for the spindle carrier are infinitely variable from 1 to 40 ipm, obtained through a dial control. Adjustable stops, engaging the teeth of a fixed rack, may be set to utilize any portion of the 8-in. vertical range. The standard rise-and-fall machine feeds down only, and rapid-traverses up and down at the rate of 100 ipm. However, machine can be arranged to feed up and down for box milling.

Plain and rise-and-fall units are equipped with Cincinnati Dynapoise overarm, containing means for damping chatter. Electrical control equipment is assembled into self-contained units designed for the machine. Optional equipment includes automatic quill retraction, together with a cam-roller attachment.

Catalog No. M-1913.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

Hand-Held Thickness Gage

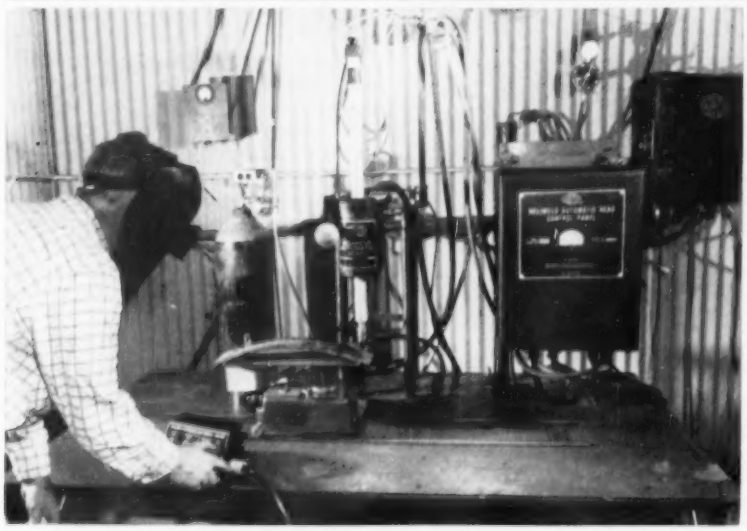
Operating on a magnetic principle and requiring no power, hand-held thickness gage is designed for quick, non-destructive measurement of the thickness of nonmagnetic materials bonded to smooth iron or steel. Gage will also measure thickness of nonmagnetic materials which can be placed over a magnetic reference plate. Typical materials which can be measured are paint coatings, platings, enamels, and sheet materials such as paper and mica.

Gage consists of a double-range scale (0.001 to 0.060 in. for high scale and 0.000 to 0.007 in. for low), range-changing slider, calibration adjuster, adjustable limit pointers, and reference thickness standards.

Accuracy of the portable instrument is reported to be 5 to 10% within 50% of the calibration point. Leather carrying case is furnished, along with four thickness standards.

Instrument Dept, General Electric Co, Lynn, Mass

Materials and Parts . . .



Airco Unit Offers Automatic Weld Cycle

Model C Heliweld automatic head provides a completely automatic weld cycle. A single switch causes the holder to move downward and start the arc, and the arc length is maintained constant throughout the weld. Unit uses company's Heliwelding tungsten inert-gas arcwelding process to join light gages of a wide variety of metals.

Electronically controlled, unit is primarily designed for dc Heliwelding with argon or helium shielding gases, or a mixture of the two. Assembly consists of head with a 32-in.-long machine holder which accommodates electrodes from 0.040 to 5/32-in. diameter up to 24 in. long; main control panel; and remote-control operator's station. Water and gas controls are included in the main control panel.

Once arc length is set, it is maintained by automatic up and down movement of the holder to follow irregular surfaces. Head can be operated in the horizontal as well as in the normal vertical position. Holder can be tilted by means of a micro-positioner 6° either side of center. Both touch starting and high-frequency-type starts (electrode does not touch work) are available.

Air Reduction Sales Co, Div of Air Reduction Co, Inc, 60 E 42nd St, New York 17, NY

Variable-Speed Drive

Known as the Selectron, variable-speed drive offers a wide speed-range compactness, a load-compensating circuit for close speed regulation, stepless control, and fast speed response.

Normal speed range is 22 to 1, but speed ranges as great as 60 to 1 can be obtained. With tachometer feedback, speed can be controlled to within 0.25%.

Standard optional features include dynamic braking, reversing, and inching control. Power supply is from ac single-phase voltages of 110, 208, 220, 440, or 550 at 50 or 60 cycles. Separate transformers for other voltages are available.

Electro Dynamic, Div of General Dynamics Corp, Bayonne, NJ

...including

MACHINE TOOLS AND ATTACHMENTS

Automatic Die Sinker 182
Vertical Broach 183
Flame-Machining Process 184
Carbide Tool Grinder 184
Metal-Cutting Bandsaw 186
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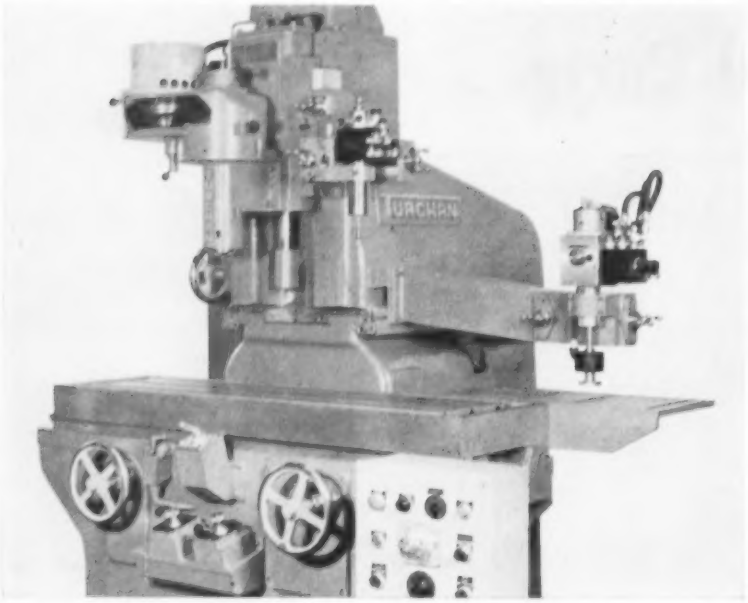


Automatic Die Sinker Has Three-Way Operation

Primarily an automatic die sinker, bed-type machine can also be used as a power-operated straight milling machine or as a hand-operated straight miller. Type of operation is selected on central knob of the control panel.

Machine is equipped with a magnetic tracer, together with a second tracer control which can be used for contouring. When unit is on fully automatic operation, operator can set the length of stroke to cover work and select index or pickfeed desired at end of cut. Automatic reciprocating feeds and index are interchangeable with ram and table, and can be changed to hand control by turning knob on control panel.

While tracer automatically coordinates vertical movement of the cutter with table and ram movements to reproduce the profile of the master model, electric limit switches control adjustment of length of stroke on table and ram.

The 17 x 17-in. table is heavily ribbed with extra-long guide ways; work and model are mounted on a common base. Folder describing machine is offered.

Turchan Follower Machine Co, 8259 Livernois Ave, Detroit 4, Mich

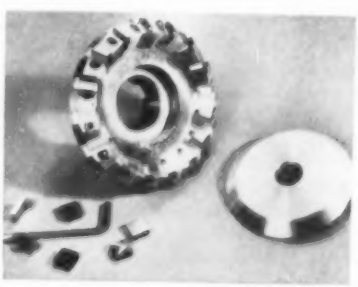
Press-Drive Roller Bearing

Type MCS-5130-C double-width radial roller bearing, which features separable outer race, bronze retainer, and crowned rollers, is designed for supporting load capacities up to 87,925 lb max at 25 rpm and 25,750 at 1000 rpm.

Bearing is constructed to enable the inner race and roller assembly to float in the outer race. Since outer race is separable, press drive shaft can be withdrawn easily without removing the outer race and roller assembly from the housing.

Bore is 5.9055 in., and OD is 9.2520 in. Width and diameter are 2⅝ in. and 8⅜ in.

Rollway Bearing Co, Seymour St, Syracuse, NY



Wesson Milling Cutters Have Throwaway Inserts

Designed to handle the majority of rough-and finish-milling operations on cast iron and steel, throwaway insert milling cutters have blades with eight indexable cutting edges. Carbide blade material called Wessonmetal is reported to cost as little as 17 cents per cutting edge.

Design of cutter permits high-speed milling at high feeds. Company reports that on one job a 4-in.-dia. cutter was used to take a roughing cut on SAE 1095 hardened-steel toolholder shanks at 1000 rpm and 1048 sfm; feed rate was 52 ipm with a 0.125-in. depth of cut. On another job cutters machined ends of structural-steel I-beams at 1200 rpm and 1250 sfm; feed rate was 40 ipm with a 0.125-in. depth of cut.

Uniform and positive blade location is achieved in cutter by placing a ring gage against the cutter face. Blades are then aligned by making contact with the gage, and are locked in position by socket screw.

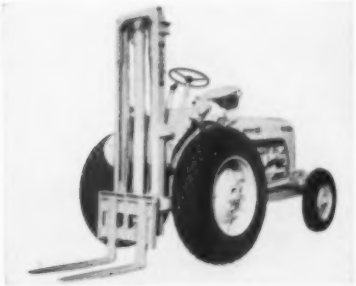
Wesson Co, 1220 Woodward Hts Blvd, Detroit 20, Mich

New Tapmatic Tapping Attachment

Model SA-2-1/2B, with 1-1/8 - 1-5/8-in. capacity, features Tapmatic weightless floating action and positive torque control clutch.

Taps are permitted to float into the work without any movement of machine spindle, assuring consistently uniform threads. Adjustments of the clutch are made for different sizes of taps and various types of materials so that tap will instantly stop when it becomes dull, loaded, or bottoms in a blind hole. All-ball-bearing construction eliminates excessive frictions; thread produced will therefore conform exactly with the tap itself. Unit is designed with individual tap holders which can be readily changed without use of tools.

Tapmatic Corp, 845 W 16th St, Costa Mesa, Calif

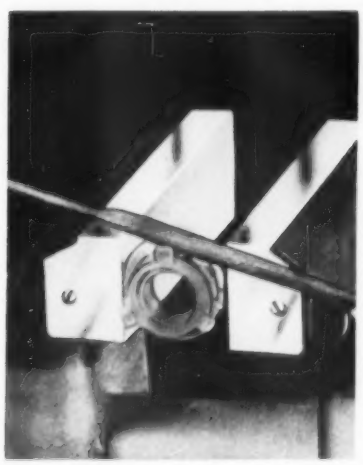


Fork Lift Truck

Super 55 fork lift truck is designed primarily for yard work, has large 12-29 tires to assure good traction in unpaved areas. With a lifting capacity of 4000 lb, models are offered with 8- or 10-ft tilting mast to accommodate different attachments: standard forks in four lengths, concrete-block fork, ½-yd hydraulic scoop bucket, and dozer blade.

Six forward speeds provide a range of from 1½ to 14½ mph, in addition to high and low reverse speeds. Unit has a turning radius of 10 ft, and steering is by hydraulic power. Bulletin A-1615.

Oliver Corp, 400 W Madison St, Chicago, Ill



Vise Jaw Face Plates Are Rubber-Faced

Nava-Mar face plates with rubber facing are available as standard stock items in all vise sizes from 2 to 6 in., including the ¼-in. size.

Rubber used, Durometer 75-85, ⅛ in. thick, is bonded to aluminum bodies; it is said to be soft enough to protect any material, yet firm enough to hold as rigidly as serrated jaws. Plates are attached to the vise with setscrews, removed with a screwdriver.

Kenimar Corp, PO Box 25, Glenville, Conn

Tape-Controlled Indexing Table

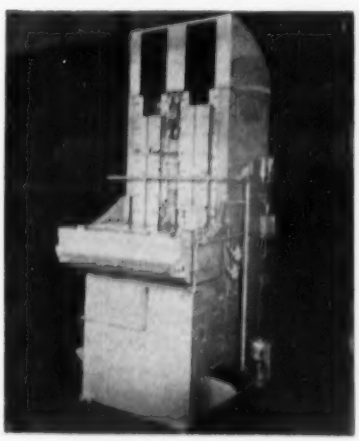
Micro-Positioner is a precision-made automatic indexing table that makes possible the reproduction in complex patterns of drilling, reaming, and tapping operations, as well as many others, with little skill required by the operator. Cost of device is said to be such that it can be included in normal tooling programs. Unit is designed to be used with radial drills, milling machines, turret drills, and other spindle machines.

Table can be set up by mounting a master part or by using an accumulator mechanism which will register table travel in inches. Wherever a hole is indicated, an indentation is made on the tape. In production, the sensing mechanism will position the holes in the work according to the tape indentations. Indexing speed of the machine is variable from 6 to 90 ipm, and table will index rapidly and position itself to the nearest 0.001 in.

Device is fully electric and push-button controlled. One tape controls transverse movements of the table and the other controls longitudinal movements. These movements are controlled electro-magnetically by an electric clutch-brake which makes split-second starts and stops of the leadscrews as the switches sense the markings on the tapes.

Unit, which eliminates need for jigs, fixtures, and drill bushings, weighs 1000 lb, and reportedly can be moved from one machine to another with ease. Illustration shows machine mounted on a radial drill, together with control console.

Micro-Positioner Corp, 716 Wilshire Blvd, Santa Monica, Calif



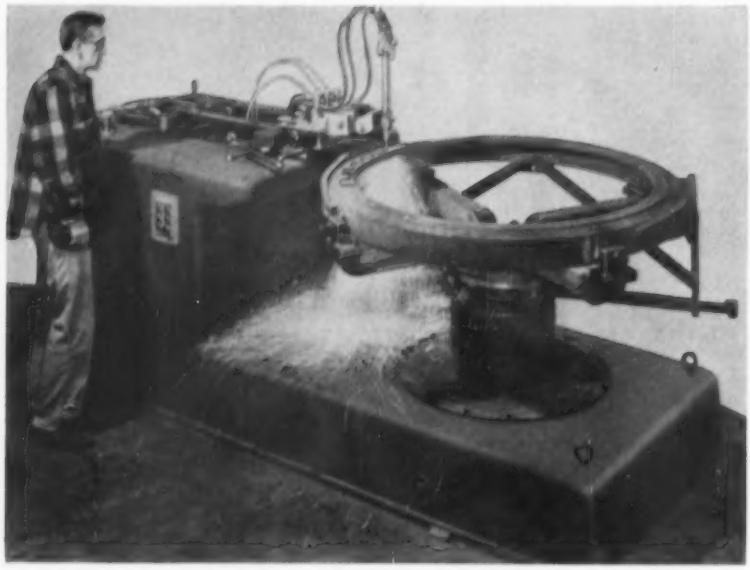
Vertical Broaching Machine

Line of 15-ton-capacity "Electro-Gear" dual-ram vertical broaching machines is available in five basic models with stroke lengths of 54, 66, 80, 90, or 100 in. Hardened and ground box-type or V-type ways are available on all models. Broaching speeds up to 80 fpm or more are obtainable.

Maker stresses smoothness of operation, which is achieved with helical pinion rack drives and balanced power loading made possible through interaction of the ascending and descending rams.

Ram speed is infinitely variable between minimum and maximum limits. Hydraulic power is provided to operate this workholding fixture, and is interlocked with the machine cycle.

Colonial Broach & Machine Co, Box 37, Harper Station, Detroit 13, Mich



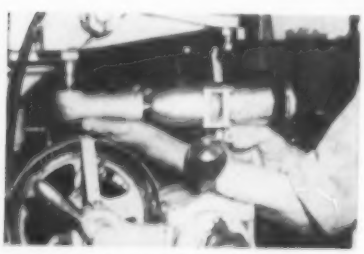
Flame-Machining Large Gears

Machining teeth in large sprockets and gears is simplified by process called Cogmatic Flame Machining. Process involves the precise control of a fast-cutting torch, moving on machined ways, over the metal blank, which is guided by a special cam for control of tooth shapes, sizes, and spacings through a pantograph mechanism.

Machining is automatic and reportedly accurate to tolerances ranging from ±0.007 in. on smaller sprockets to ±0.015 in. on larger sprockets.

Maker reports that practically any size work can be handled, in diameters up to 100 in. and up to 3-in. thickness. Company offers a special booklet covering the technique of flame machining.

Seaman-Andwall Corp, 305-10 N 25th St, Milwaukee 1, Wis



Right-Angle Attachment for Air-Electric Impact Wrenches

No. 568 right-angle attachment fits any ½-in-sq drive impact wrench, air- or electric-driven, and is designed for operations involving comparatively inaccessible locations. Featuring a 29/32-in. spindle offset front, unit is less than 6 in. long and has a head height of only 2¾ in. It weighs 2½ lb.

Attachment includes a heavy aluminum housing, alignment bushings, and locking pins; spindles are built of tool steel and all gears of an alloy steel. Oil-sealed anti-friction bearings are provided.

Thor Power Tool Co, Aurora, Ill

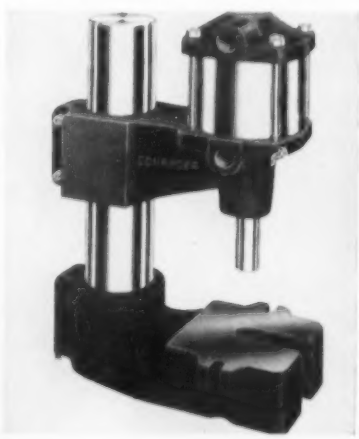
Carbide Tool Grinder

Designated Poweramic, offhand, single-point carbide tool grinder eliminates all lateral tool movement ordinarily performed by the operator and produces micro-finishes on all standard and special single-point tools, including square-nose, V-nose, straight-turning lead-angle, offset-turning, facing, and boring tools. Features include "TruArc" oscillation of grinding wheel and free-wheeling, counter-balanced worktable. Only a slight pressure on the worktable is needed to feed the tool into the grinding wheel.

Motor-spindle—grinding-wheel assembly is supported on pivots, and the entire motor-spindle unit is oscillated mechanically by a motor-actuated crank mechanism at the rate of 150 strokes per minute. Because grinding-wheel face reciprocates across the carbide tip, grinding action maintains uniform flatness of the wheel face, eliminating wheel-dressing operations to flatten a "grooved" wheel face.

Angular settings of table, ranging from 7° above to 20° below horizontal, are obtained by a crank mechanism. Coolant is supplied through a self-contained pumping unit in the base of the machine.

Wesson Co, 1220 Woodward Hts Blvd, Detroit 20, Mich



Schrader Air Press

Outfitted with two-bolt clamping which adjusts from 0 to 7 in. in height, air press is available as single-acting for impact jobs and double-acting for squeeze and power withdrawals. Unit has a swing arc of 2 in. on each side of center.

Maker reports that press can stamp, coin, broach, rivet, stake, press, shape, bend, and assemble. Ruggedness of the machine is stressed in its sturdy cylinder bracket and extra-heavy cylinder wall. Control and speed of cylinder can be varied as necessary.

Descriptive bulletin is offered.

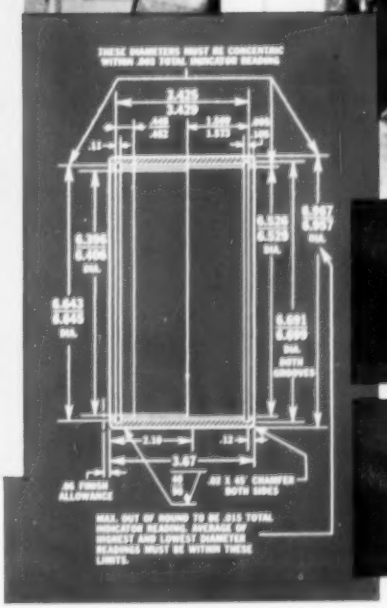
A Schrader's Son, Div of Scovill Mfg Co, Inc, 470 Vanderbilt Ave, Brooklyn 38, NY

Automobile Manufacturer produces

Repetitive Pieces to Close Tolerances with

BULLARD MULT-AU-MATIC Type "L"

At one of the nation's largest automotive plants, a number of Bullard Mult-Au-Matics, Type "L" are employed to produce automatic transmission parts. According to the Process Engineer "The transmission is the most precision piece of equipment in the entire car — with many moving parts fabricated to close tolerances."



If you have need to manufacture to exacting tolerances it will pay you to investigate the many advantages offered by Bullard Mult-Au-Matic, Type "L".

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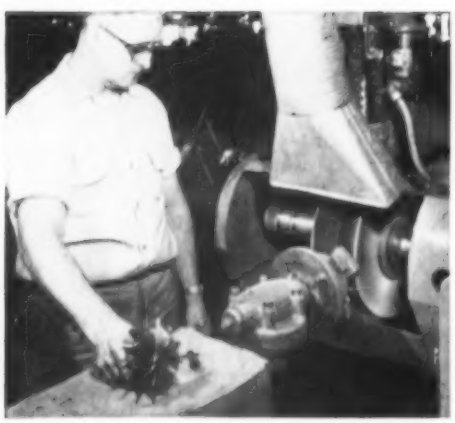
Super finish for turbo-supercharger



A leading manufacturer of turbo-superchargers uses Osborn's Brushamatic 3A to cut compressor wheel finishing costs from 48¢ to 16¢ per part.*

*Trade-Mark

THIS aluminum compressor wheel is the heart of a new turbo-supercharger designed to increase engine horsepower up to 60%. Osborn power brushing methods remove all machining burrs from this compressor wheel . . . maintain a finish tolerance of two ten-thousandths of an inch. In addition to improving the quality of this compressor wheel, Osborn power brushing cuts finishing time from 12 minutes to 4 minutes per part.

The automotive industry is just one of many using Osborn power brushing to improve and speed up finishing operations.

An **O**sborn **B**rushing **A**nalysis, made in your plant, will show how *you* can improve finishes, reduce finishing costs. Write *The Osborn Manufacturing Company, Dept. C-46, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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MACHINES AND ATTACHMENTS

1 UNIVERSAL TURRET LATHE—*Gisholt Machine Co, Madison 10, Wis.* 18-page catalog describes Masterline ram-type units. Features, accessories and tools illustrated; specifications for four models provided.

2 PRESSES—*American Chain & Cable Co, Manley Division, Bridgeport 2, Conn.* 16-page illustrated bulletin DH-486 covers line of hydraulic and air-operated units of 25 to 150-ton capacity. Tabular data on 10 models includes specifications, capabilities, capacities, accessories.

3 TRACING ATTACHMENT—*Pratt & Whitney Co, West Hartford 1, Conn.* 4-page circular 597 illustrates and describes Velvetrace Kelliering attachment for copying intricate forms in metal; adaptable to standard milling machine. Spindle speeds are from 300 to 10,500 rpm. Operating principle and specifications included.

4 DI-ACRO METALWORKING MACHINES—*O'Neil-Irwin Mfg Co, Lake City, Minn.* 44-page illustrated catalog describes operations of variety of machines for die-less duplicating. Nine basic units, available in 45 sizes; hand-operated and power models. Specifications, accessories, material forming capacities covered.

5 GEAR-CHECKING EQUIPMENT—*National Broach & Machine Co, Detroit 13, Mich.* 16-page bulletin C55-9 contains information on universal gear checker and five interchangeable measuring heads for inspecting gears for index errors, eccentricity, wobble, lead or helix angle errors, size, and tooth parallelism.

6 SAWS — *Ty-Sa-Man Machine Co, Knoxville, Tenn.* 8-page catalog 1235 pictures and describes friction, abrasive, cutoff, and long-cut units. Advantages and construction features covered, specifications listed.

7 DIE CUSHIONS—*Danly Machine Specialties, Inc, Chicago 50, Ill.* 24-page catalog contains illustrated data on all types of cushions for presses with JIC bed openings from 14 x 14 in. to 213 x 87 in. Includes pneumatic, multiple piston pneumatic, pneumatic locking, hydropneumatic, and custom type in capacities from 3.93 to 301.5 tons at 100 psi. Performance and dimensional data included.

8 PRESSWORKING EQUIPMENT—*Herr Equipment Corp, Warren, Ohio.* 6-page bulletin 561 illustrates and describes units for continuous processing lines and punch and shear lines. Includes coil cars, payoff and coiling reels, levelers, press feeds, stitchers, slitters, bridles, shears, and accessories.

TOOLS AND ACCESSORIES

● CARBIDE TOOL PRODUCTS—*Coromant Division, Sandvik Steel, Inc, 1702 Nevins Rd, Fair Lawn, N.J.* 32-page illustrated catalog 56 covers complete line including blanks, inserts, carbide-tipped tools, toolholders, combination cutters, shell end mills, and twist drills. Technical data section lists grades, grade recommendations, cutting speeds and hp requirements. Request direct on company letterhead.

9 TORQUE MANUAL—*P A Sturtevant Co, Addison, Ill.* 28-page second edition contains illustrated data on general principles of torque tools and methods of use. Includes torque application formulas; conversion tables; explanations and solutions to adapter problems; detailed information on torque wrenches.

10 THERMOCOUPLES—*Barber-Colman Co, Wheelco Instruments Division, Rockford, Ill.* 40-page booklet F-5228-3 discusses construction and application of thermocouples and radiation detectors as used on control applications. Standard thermocouple temperature-millivolt equivalents included.

11 GRINDING WHEELS—*DoAll Co, Des Plaines, Ill.* 4-page illustrated folder covers line of surface grinding and bench grinder wheels. Composition and applications of fundamental types described. Meaning of code numbers or markings explained.

12 REVERSIBLE PLUG GAGES—*Pratt & Whitney Co, W Hartford 1, Conn.* 4-page illustrated folder contains information on go and not go cylindrical and thread gages. Standard sizes and specifications given.

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13 PROFILOMETER EQUIPMENT—*Micrometrical Manufacturing Co, Ann Arbor, Mich.* 14-page illustrated catalog 156 describes equipment for manual operation; straight-line mechanical tracing; circular tracing; recording microinch roughness readings; and special equipment.

14 PORTABLE ELECTRIC JIG SAW—*Porter-Cable Machine Co, Syracuse 8, NY.* 26-page manual illustrates and describes applications and operation of heavy-duty Bayonet Model 148.

15 AUTOMATIC LUBRICATORS—*Bijur Lubricating Corp, Rochelle Park, NJ.* 4-page bulletin 3-B contains illustrated description of cyclic-type units that provide positive metered oil feed by simple mechanical drive from machines they lubricate. Data on two types for larger machines includes construction features, reduction ratios, direction of drive, discharge volume.

16 SUPER - PRECISION MASTER BALLS—*Industrial Tectonics, Inc, Ann Arbor, Mich.* 8-page technical booklet 552 discusses applications in solving difficult gaging problems and for supplementing gage blocks in setup and measurement. Master ball set illustrated, described.

HEAT-TREATING AND WELDING

17 WELDING EQUIPMENT—*General Electric Co, Schenectady 5, NY.* 20-page illustrated buyers guide GEC-1033 covers all types, including ac and dc general purpose and industrial welders, semi-automatic and automatic equipment, carbon block brazing equipment, and accessories. Ratings, specifications given, as well as description and analysis for electrodes.

18 HEAT-TREATING BERYLLIUM COPPER ALLOYS—*Beryllium Corp, Reading, Penna.* 8-page bulletin describes methods and procedures used for wrought and cast alloys. Information included on fixtures, furnaces, annealing methods, cleaning and brightening, melting. Properties of various alloys available given in tabular form.

19 FURNACES AND OVENS—*L & L Manufacturing Co, Upland, Chester 29, Penna.* 20-page catalog illustrates and describes standard and special furnaces (ranging to 3000 F in several series), ovens, and accessories.

PLANT SERVICE EQUIPMENT

20 CORROSION—*Vibradamp Corp, Industrial Coatings Division, Jackson, Mich.* 26- page bulletin "Guard Against Corrosion," discusses seven types, and suggests methods of surface treatment for control. Variety of coatings described with chart showing degree of protection against 81 corrosive agents.

21 PUMPS—*Chempump Corp, Philadelphia 18, Penna.* 4-page bulletin 1050 details features and specifications of Series C canned motor units for leakproof pumping of corrosive, toxic, and problem fluids at heads to 190 ft, capacities to 200 gpm.

22 SHOCK & VIBRATION MOUNTINGS—*Robinson Aviation, Inc, Teterboro, NJ.* 8-page bulletin 1000 illustrates and describes Adjust-O-Mounts with load ranges of 100-10,000 lb per unit. Advantages of these all-metal mountings with stainless steel cushions discussed; dimensions and applications covered.

23 POWER CONVERSION RECTIFIERS—*Bart-Messing Corp, Newark, NJ.* 12-page illustrated catalog 127 covers new germanium and selenium rectifiers. Sizes and styles for every dc power need detailed to aid in selection; basic, remote control, and self-contained units described for variety of applications.

PARTS AND MATERIALS

24 OILITE BRONZE BEARINGS—*Amplex Division, Chrysler Corp, Detroit 31, Mich.* 22-page illustrated Stock List S-56 gives dimensions of sleeve, flange, and thrust self-lubricating bearings ranging from ⅛ to 4 in. ID. Sections on cored, bar, and plate stock included, plus 6 pages of engineering data.

25 UNBRAKO FASTENERS—*Standard Pressed Steel Co, Jenkintown, Penna.* 30-page revised catalog contains tabular data on size ranges and specifications such as number of threads per inch, length, and quantities per package of screws, bolts, plugs, dowel pins, and socket screw keys. Illustrations, engineering drawings, applications included.

26 MOLDED PLASTIC—*Continental-Diamond Fibre, Newark, Del.* 15-page catalog C-56 describes and illustrates features of Celoron, a synthetic-resin-impregnated material for applications requiring toughness, resiliency, mechanical strength, and controlled electrical properties. Technical information and specification tables.

27 SERVO MOTORS—*John Oster Manufacturing Co, Avionic Division, Racine, Wis.* 4 catalog pages illustrate and describe types of low inertia units. Graphs, dimensional drawings, average characteristics, and complete electrical data.

28 MICROLOY GROUND FLAT TOOL STEEL—*Capewell Manufacturing Co, Hartford, Conn.* Combination wall chart and file folder lists all standard sizes, physical characteristics, and tolerances.

29 COUPLINGS—*Browning Manufacturing Co, Maysville, Ky.* 8-page illustrated catalog V-169-E describes rigid and flexible types, and new line of minimum bore (reborable) chain couplings. Complete specifications and hp-rating charts included.

30 INDEXING TURNTABLES, VARIABLE SPEED CONTROLS—*Eisler Engineering Co, Newark, NJ.* 12-page catalog 88-56 contains illustrated descriptions of variety of types and sizes of standards and specials. Descriptive data on Geneva gear and barrel cam drives included.

31 BOLTS—*Aero Supply Mfg Co, Corry, Penna.* 12-page booklet "Let's Make a Bolt" presents illustrated information on manufacture of aircraft quality bolts from original wire stock to finished products.

32 METAL STAMPINGS — *Dayton Rogers Manufacturing Co, Minneapolis 7, Minn.* 24-page illustrated Form 151 describes production of die-cut parts in small lots. Design and construction of type of dies used for short-run operations discussed.

Continued on page 218

USE OF "HARTFORD SPECIAL" DRILL UNITS

INCREASES PRODUCTIVITY 211.7%

CUTS COST PER PART 32%

REPORT FROM WOODRUFF & EDWARDS, INC., ELGIN, ILL., SUCCESSFUL PRODUCER OF PARTS FOR LEADING MANUFACTURERS SINCE 1869

Processing cast iron pivot yokes for a major appliance manufacturer posed a problem for Woodruff & Edwards. The major headaches were:

1. The part was being milled, drilled, faced and turned on four separate machines.
2. Production per 8 hour shift was 600 parts, but required more than two men who consumed 22 manhours.
3. The scrap figure was very high.
4. Cost per part was high.
5. Loss and delay in handling were high.

Woodruff & Edwards solved the problem by designing and building their own production machine around four standard "Hartford Special" Air-Hydraulic Drill Units. The successful results:

1. Now in one machine, four holes are drilled, two spotfaced, one boss hollow milled, spotfaced and chamfered, another boss chamfered and a shoulder spotfaced and chamfered.
2. Production per shift is still 600 parts but requires only 8 manhours, an increase in productivity of 211.7%.
3. ***Not one yoke in over 100,000*** delivered to the customer ***has been rejected.***
4. A saving of 32% per part has been realized, including a recent rise in cost of material!
5. Parts are now handled by one man and are shipped **directly** to the assembly line of the customer with a **minimum** of delay.

PETE LENART, Dept. Foreman, says, "This is a very efficient operation with practically no machine maintenance. The setup is extremely compact because the Hartford Drill Units are space saving, and easy to install, too."

RICHARD HAMPEL, a Supt. of Woodruff & Edwards who helped design the machine says, "We have achieved a fine record on this job, and the Hartford Drill Units deserve the lion's share of the credit."

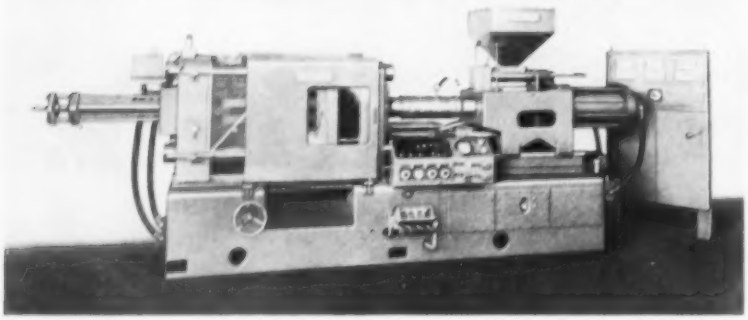
Take a tip from the Woodruff & Edwards story. Let "Hartford Special" Drill Units and other standard components bring higher production at lower cost to your plant.

MACHINE TOOL DIVISION

THE HARTFORD SPECIAL MACHINERY CO.

2826 HOMESTEAD AVE., HARTFORD 12, CONN.

HARTFORD *Special*



Redesigned Injection-Molding Machine

Model 275T-8/10-oz plastic injection-molding machine has dry cycle time of under 8 sec, is said to be 60% faster than Reed Model 10D-8 oz machine which it replaces. Plasticizing capacity is 20% greater; newly designed heating cylinder plasticizes up to 120 lb of material per hour. Tapered spreader design creates mulling action for thorough plasticizing, which is controlled by four-zone temperature control.

Mold clamping stroke is adjustable between 6¼ and 10¼ in. Die space adjustment is accomplished hydraulically to facilitate mold setup. Built-in stuffing arrangement provides injection capacity per shot of 10 oz or more through multiple strokes. Injection speeds can be varied from 79.2 ipm with two booster pumps to 148 ipm using three pumps. Rate of injection is 800 cu in. per minute.

Machine develops 275 tons of positive mechanical mold-locking pressure. Rated projected casting area is 125 sq in. Mold platens measure 22½ x 25 in.

Operating controls are centralized in console panel, and floor-mounted cabinet houses electrical controls, three proportioning-type pyrometers, and a variac for nozzle temperature control. Safety button is provided which automatically opens dies during any part of machine cycle and withdraws the plunger housing. As optional equipment, low-pressure die-closing unit, which stops machine if a part fails to eject automatically, can be supplied to protect molds during fully automatic operation.

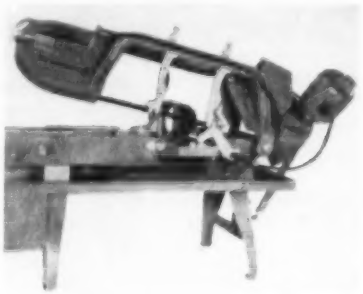
Reed-Prentice Corp, Worcester 4, Mass

Gold-Colored Aluminum

Process for producing non-fading gold-colored aluminum has been developed by Kaiser Aluminum & Chemical Corp.

Source of color is built into the metal itself. Color is brought out without use of dyes or other coloring materials by anodizing under readily controlled conditions. Color may be varied from pale straw to deep gold and gold-bronze tones, finish may be either bright or satin. Material, being produced in sheet form, is designed to be applied as an integrated cladding on standard aluminum alloy sheet. Upon anodizing, gold color is imparted.

Kaiser Aluminum & Chemical Corp, Kaiser Bldg, 1924 Broadway, Oakland 12, Calif



Metal-Cutting Bandsaw

Model 1000 is large-capacity bandsaw equipped to handle rounds to 10 in. and rectangular shapes to 10 x 16 in., with extra capacity for end cuts up to 11 in. diameter. Machine is driven by a ¾-hp ball-bearing motor and uses 1-in.-wide blades.

Design features include company's "Constant Load" blade-tensioning device; selective speeds of 50, 100, 175, and 275 fpm; hydraulic frame check; and swivel vise to 45°.

Other specifications: height to top of bed, 25½ in.; width of bed, 10½ in.; floor space, 24 x 72 in.

Wells Mfg Corp, 505 Roosevelt Rd, Three Rivers, Mich

Cut-off Machine Features Pneumatic Feed

An addition to company's "Light-Heavyweight" line, cut-off machine is available for use with a dry-cutting abrasive wheel for cutting rod, bar, and tubing stock, or for use with high-speed saw blades. Machine uses wheels or blades up to 12-in. diameter.

For repeated production operations, unit is available with an air feed attachment called Air-Pak. This pneumatic device requires no electrical connections and can be installed without machining. Unit consists of air filter, regulator, gage, pilot-operated 4-way valve, air cylinder, and all other necessary control valves.

Automatic spray coolant system is also available. Cast-iron table comes drilled so that the head may be mounted at 45° for mitering. 3 hp, 220/440v, 3-phase motor is supplied with the machine.

Walker-Turner, Inc, Plainfield, NJ

Soldering flux, Hi-Grade No. 29, will reportedly decompose completely during soldering of copper and copper alloys, leaving parts free of any residues. Washing and buffing operations after soldering are consequently eliminated.

Hi-Grade Alloy Corp, 1236 S Talman, Chicago 8, Ill

Insulation block, designated Fiberfrax F-20, is a bonded ceramic fiber block said to be resistant to temperatures up to 2300 F, and chemically inert. Approximate density is 20 lb per cu ft, about 7 lb more than the original F-13 block, resulting in improved compressive strength.

Carborundum Co, Niagara Falls, NY

The gears in an automatic nut former have to be tough and strong to withstand heavy, varying loads. Yet, the castings from which they're made should be easy to machine. That's why this gear for a Waterbury Farrel Automatic Nut Former is made from ASTM-50 gray iron with a nominal composition of 1% nickel and .50% molybdenum.

Moly gives cast iron gears higher strength with toughness and good machinability

"To insure a tough, easily machined gray iron for the gears in our Automatic Nut Formers," says Henry C. Griggs, Metallurgist for Waterbury Farrel Foundry & Machine Co., "we specify .50% molybdenum in our ASTM-50 material. The properties of this material contribute importantly to the reputation of Waterbury equipment for accuracy and high speed production under severe operating conditions."

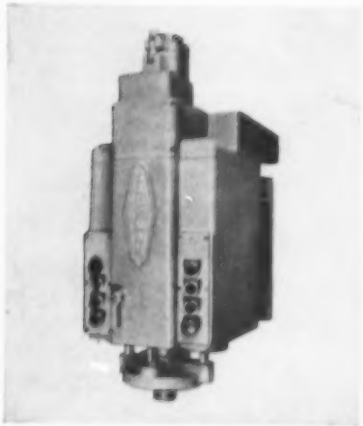
Molybdenum helps to give reliable and reproducible castings — very important factors in consistent performance of gears.

Investigate moly irons. They may be the key to better performance in many of your gear applications.

For the first two in a series of bulletins, "Why Moly Iron," or for technical assistance, write Climax Molybdenum Co., Department 12, New York 36, N. Y.

CLIMAX MOLYBDENUM

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Heavy-Duty Tapping Head

Series 101 tapping head can be mounted vertically or horizontally, arranged in combinations to do two or more operations, or mounted horizontal or angular in combination with vertical heads to do various operations simultaneously. Unit can be adapted to single-spindle or multi-spindle operations. Non-reversing motor drive gives spindle speeds ranging from 35 to 785 rpm through pick-off gears and pulleys or a variable-speed drive.

Torque control, with a change of setting, will provide safe driving of a ⅜- or a 2-in. pipe tap, or it can be set to handle a ⅝-in. UNC or a 2-in. UNC tap in a sensitive manner. Sensitive torque control minimizes tap breakage, signals overload, and stops machine automatically when necessary.

Other specifications: leadscrew travel, 4½ in.; total spindle travel, 4¾ in.; distance center of spindle to column, 15 in. Same head can be furnished for drilling and reaming, using single spindle or multiple head.

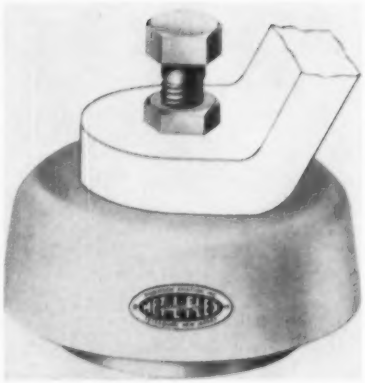
Kaufman Mfg Co, Manitowoc, Wis

Automatic Safety Controller Protects Conveyor Systems

Electro-mechanical device, designated Tipp-Tronic, provides warning and prevents damage from abnormal load conditions on electrically driven systems. It eliminates need for shear pins, slip clutches, and other mechanical safety devices. Unit also affords protection against extreme overload and need for lubrication which results in the minimum line pull to keep within its ultimate rating.

Self-contained package instantly shuts off the conveyor system at any predetermined load setting; it measures and acts upon variations from normal load over a wide range.

Tipp Manufacturing Co, Tipp City, Ohio

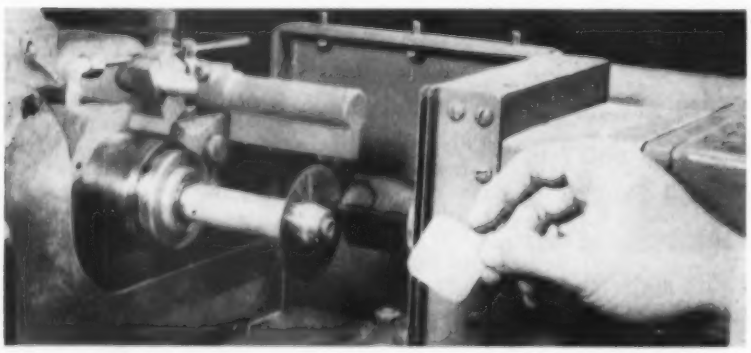


Adjustable, All-Metal Mount For Industrial Machinery

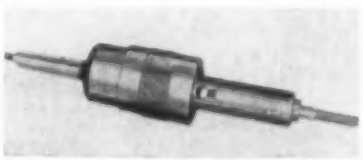
Adjust-O-Mount W339, a larger unit (7 11/16-in.-dia) based on the W139 design, has increased load-carrying capacity in three models ranging from 1000-10,000 lbs per unit without alteration in the compact housing dimensions.

Lower natural frequency of 7-10 cycles per second provides greater absorption of vibration shock and noise. Met-L-Flex stainless steel resilient elements offer maximum damping plus long life resistance with performance reportedly unaffected by oil, water, solvents, dust, or extreme temperatures. Built-in leveling bolt and jam nut permits quick installation on uneven floors.

Robinson Aviation, Inc, Teterboro, N J



PRECISION SLICING MACHINE called Microtomatic Model MTA-1 was developed for slicing germanium ingots, used in transistors, into thin wafers 0.010 to 0.015 in. thick. Hydraulically actuated machine employs a circular diamond saw blade for the operation, in which ingots are cemented to headstock, then fed into wheel at rates as low as 1/16 ipm. Machine can also cut wafers into tiny squares for use in smaller transistors; in this dicing operation, wafers are cemented to ceramic plates, then spindle shaft extension carrying 12 diamond saws spaced 0.250 in. apart makes two passes over plates to cut squares—*DoAll Co, 245 N Laurel Ave, Des Plaines, Ill*



Safe-Torque Tap Drivers

Improved line incorporates a modified overriding clutch that completely disengages tap from driver, preventing or reducing tap breakage. Higher tapping speeds and increased production are achieved because units operate at any speed taps can take.

If driver releases before hole is completely tapped, operator can check for dull, soft, or improperly sharpened tap, wrong tap for the job, faulty hole, or change in material. Adjustment of torque is simplified because each driver is marked with a normal and high torque setting for each tap size.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill

Welsbach High Pressure Service Gas Valve with Revere Arsenical Bronze Stem.

REVERE

Deep-Drilling Brass Rod

Increases Tool Life over 200% for Welsbach Why not try it yourself?

In the manufacture of valves the Kitson Division of The Welsbach Corporation, Philadelphia, Pa., has to deep-drill brass rod. Originally the rod was free-machining brass. However, when Revere discovered the extent of the drilling it was suggested that our Mixture 252, Deep-Drilling Brass, would be preferable. This was tried, and the machine shop foreman reported that tool life was increased over 200%. In one item it is possible to bore with a single operation, against the former practice of withdrawing the drill three times in order to clear the chips. Revere's Deep-Drilling brass produces very small, easily cleared chips.

Another item is a high pressure gas valve, with a cast body and brass rod stem. The rod was changed to arsenical bronze, which costs a bit more, but it ended flaking and galling between stem and seat, and materially reduced rejects. Still another instance of Revere service concerns a hot water heater relief valve. The original model was cut out of bar stock. We suggested a high leaded brass tube, hexagon outside, round inside. This greatly reduces machining, has a better surface, and a better seat. Costs more by the pound, but saves more by the piece.

Revere salesmen and Technical Advisors are always glad to collaborate in seeking ways to save money and improve products. Perhaps we can help you!

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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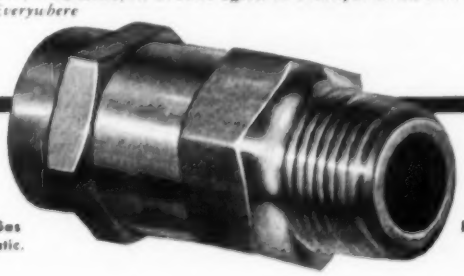
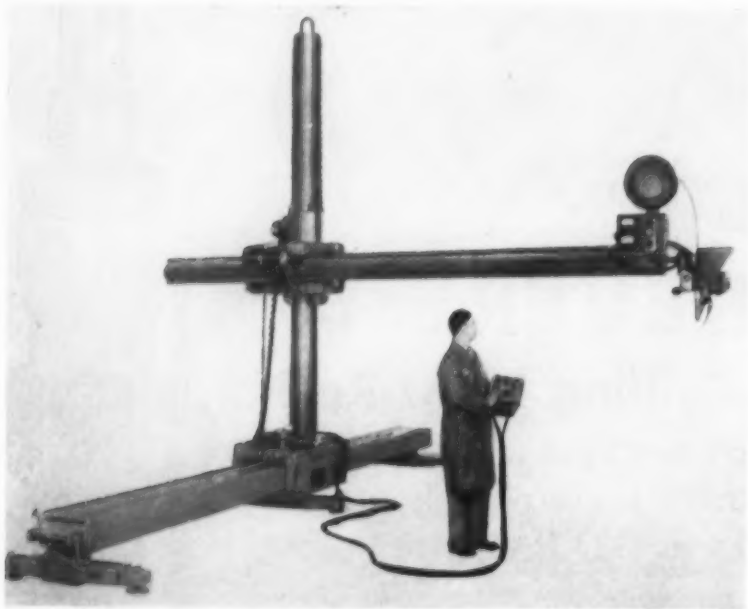
Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere



Welsbach Temperature-Pressure Relief Valve.

Welsbach Emergency Gas Shut-Off Valve, automatic.

Pressure Relief Valve for water heaters.



Automatic Welding-Head Manipulator

Originally developed by Lewis for its own use in the fabrication of large weldments, company's "Universal" automatic welding-head manipulator is being manufactured on a production basis.

Portable machine provides simultaneous 3-directional travel, infinitely variable welding speeds up to 72 ipm, 360° boom rotation, and an adjustable track that is said to reduce greatly setup times for heavy weldments. Simplified electrical operating controls include a remote pushbutton console for the operator.

Any standard sub-arc or inert-gas automatic welding head may be used with the machine. Unit illustrated is a standard 12 x 12 x 18-ft track-type Universal.

In addition to standard and special track-type units, both pedestal-type (portable) and column-type (fixed base) models are available.

Lewis Welding & Engineering Corp, Welding Div, 68 Interstate St, Bedford, Ohio

Self-Lubricated PVC Plug Valve

Plug valve, designed to handle a wide variety of corrosive fluids, has been added to Tube Turns Plastics' line of injection-molded PVC piping components.

Teflon bearing buttons on the plug provide the self-lubricating characteristic. Straight-through port permits unimpeded flow conditions; adjustments compensate for wear, positive closing, and self-indicating port positions. Nub on the bottom can be tapped for insertion of a drain plug. Valve is furnished with threaded ends, or with socket ends for solvent welding. It is currently furnished in 1, 1½, and 2-in. sizes; 3 and 4-in. sizes will be available later.

Tube Turns Plastics, Inc, 2929 Magazine St, Louisville 11, Ky

Di-Met Lapping Machine Produces Micro-Inch Finishes

Designed for producing micro-inch finishes on all types of tungsten carbide and ceramic cutting tools, Di-Met finisher is equipped with two removable, rotating Meehanite laps of 6-in. diameter. Wheels are charged with company's diamond compound; tools are held on either of the two tilting tables and reciprocated slowly across the face.

Maker reports that in two minutes or less a rough-ground tool can be brought to an edge with a finish of from ½ to 6 mu-in., depending on grade of compound used.

Finisher has a removable head, permitting unit to be used on bench or pedestal. Pedestal is equipped with shelf for storage of compound. Accessories include a flexible-shaft unit for buffing lapped edges to a mirror finish.

Di-Met Corp, 1873 Mullin St, Torrance, Calif

Universal Abrasive Belt Grinder

Unit can be used as a standard belt swing grinder. In addition, it can be lathe-mounted from the back crossslide for polishing and precision grinding of cylindrical parts. Device may be bench-mounted for contact wheel grinding and contour polishing, or it can be equipped with a platen for flat surfacing and slack-of-the belt polishing.

Grinder is furnished in 1½, 2, 3, 5, 7½, and 10-hp sizes. The first three use 3-in.-wide by 132-in.-long abrasive belts; latter three use 4 x 132-in. belts.

Abrasive Machinery Corp, 432 S Pennsylvania St, Indianapolis, Ind

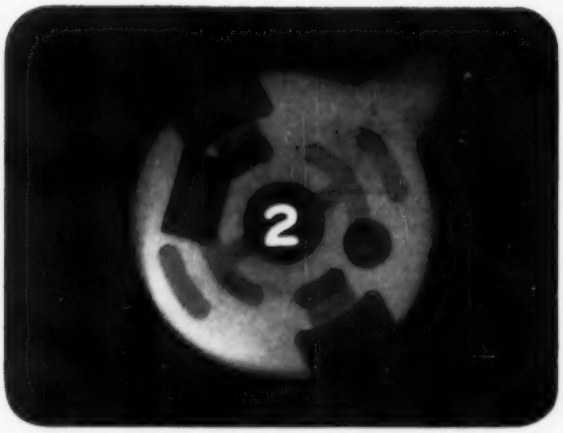
Barrel-finishing media, called Honite Ceramicones, is available in conical ceramic shapes. Tapered ends permit access to holes for deburring; broad bases prevent lodging. Resistance to wear is said to preserve original dimensions over a long period of time. Cones are ½ in. high, ⅜ in. through base, and 7/32 in. across the top.

Minnesota Mining & Manufacturing Co, Dept F6-48, 900 Fauquier St, St Paul 6, Minn

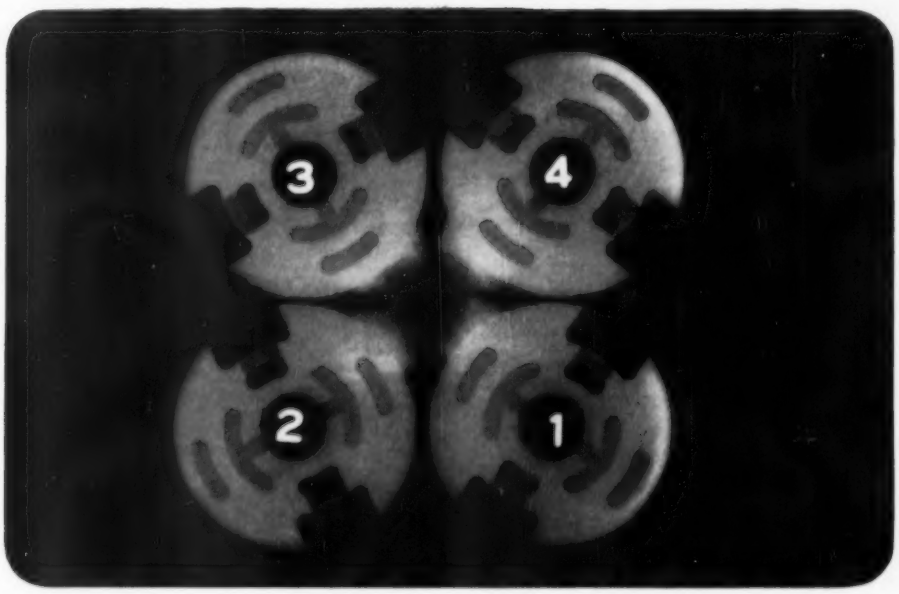
Snips and shears added to the Niagara hand-tool line include three compound leverage shears for straight, right, and left cuts (can cut up to 18-gage steel); three sizes of straight snips; and three combination snips for intricate pattern and scroll work. Bulletin 78.

Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY

1. Radiography revealed considerable internal shrinkage with original casting technics—suggested a change in gating.



2. Radiography, after a change in the "in gate," showed that there was definite progress in eliminating shrink.



3. Radiography shows the final technic, with the "in gate" further increased in size and a minor redesign to improve progressive solidification, produces a satisfactory casting.

Radiographs courtesy of New York Air Brake Company

Radiography shows how to correct Shrink

More and more cases like this occur every day. So it's easy to see why progressive suppliers of quality castings make continually greater use of radiography. It points the way to sound production quickly—gives assurance that only high-quality work is delivered.

If you would like to take advantage of radiography in your operations, talk it over with your x-ray dealer. Or write to us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY, X-ray Division, Rochester 4, N.Y.

Radiography . . .

another important example of Photography at Work.

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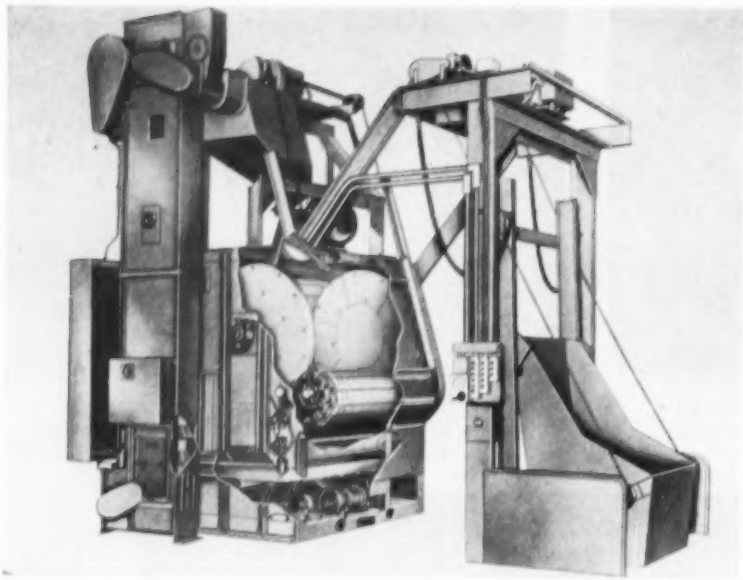
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Airless Abrasive-Blast Cleaning Machine

Super Tumblast is designation of batch-type cleaning machine designed for improved blast-cleaning efficiency and reduced cleaning costs. Machine has a load capacity of 28 cu ft, and is intended for cleaning sand, scale, oxides, and other contaminants from any work that can withstand a tumbling action.

Airless blast unit throws 830 lb of abrasive per min in the machine, which employs only one abrasive hurling wheel. Blades have been designed for increased life and simplified method of replacement.

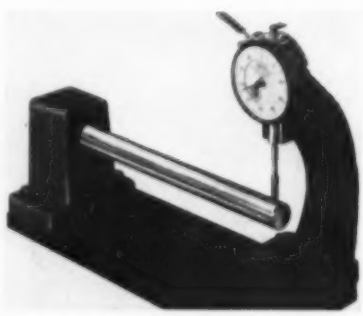
Sand and scale are removed from the abrasive in the separator, which operates on air separation principle and is mounted at the bottom of the machine for easy servicing. Steel flight conveyor is specially designed so that there are no areas where work can jam and displace liners, interfere with operation of the door, or break the abrasive-tight seal on the machine.

Maker stresses machine's usefulness for automatic operations. Single pushbutton will actuate the entire sequence from loading to unloading.

Wheelabrator Corp, Mishawaka, Ind

Aluminum paint, designated Halum, produces a simulated hammered finish. Coating is said to be highly resistant to fumes, oils, grease, mild acids, adverse weather conditions. Product reportedly air dries in 24 hours, can be applied by brush, spray, or roller.

Speco, Inc, 7308 Associate Ave, Cleveland 9, Ohio

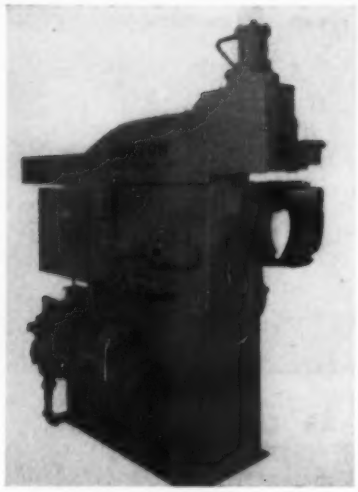


Federal Dial Bench Gages Have Adjustable Throat Depth

Gages for measuring thickness of tubing or sheet material are equipped with precision mandrel on which work is positioned, and a jeweled, low-friction dial indicator which magnifies the dimension.

Throat depth can be varied in increments of 1 in. by relocating indicator support arm in holes provided in the gage base and sliding the mandrel the required distance. Model KB-410 has adjustable depth from 4 to 8 in., Model KB-411, 8 to 12 in. Unit can be used as a simple comparator by removing mandrel. Radiused reference contact point on the mandrel is located directly under the indicator. In addition, mandrel support can serve as a reference point so that when work is placed against it, indicator will measure at the same point on every piece.

Federal Products Corp, 1144 Eddy St, Providence 1, R I



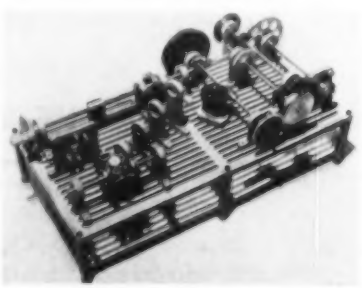
Morton Flash Trimmer Features Automatic Work Ejector

Hydraulic flash trimmer with 8-in. stroke is offered for high-speed production trimming of the inside and outside of butt-welded rings from 5-in. diameter up with maximum thickness of ⅛ in.

Automatic ejection of the work is provided by twin arms operated hydraulically. At the moment the draw-cut trimming cycle is completed, the twin arms automatically eject the ring from the machine.

Three toolholders and cutting tools are provided in each ram, and are quickly removable for sharpening and replacement. Cutting cycle is automatic through a foot switch. 10-hp ac motor and control equipment are provided for furnishing the hydraulic operations.

Morton Mfg Co, Broadway and Hoyt, Muskegon Heights, Mich



BREADBOARD DEVELOPMENT PARTS come in two basic sizes of 8 x 8 in. and 8 x 16 in., with larger sizes available on request. Cast-aluminum material is anodized and precision machined all over to assure proper alignment of all gearing. Catalog No. 7—PIC Design Corp, 160 Atlantic Ave, Lynbrook, LI, NY

...for piloted taps from stock

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Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

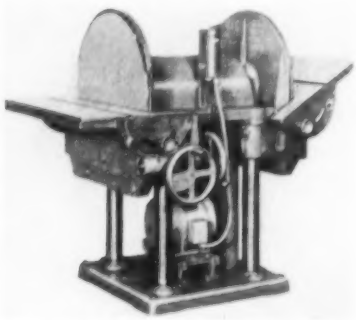
Made by THREADWELL, Greenfield, Mass.

Redesigned Drill Heads Feature Interchangeable Cluster Plates

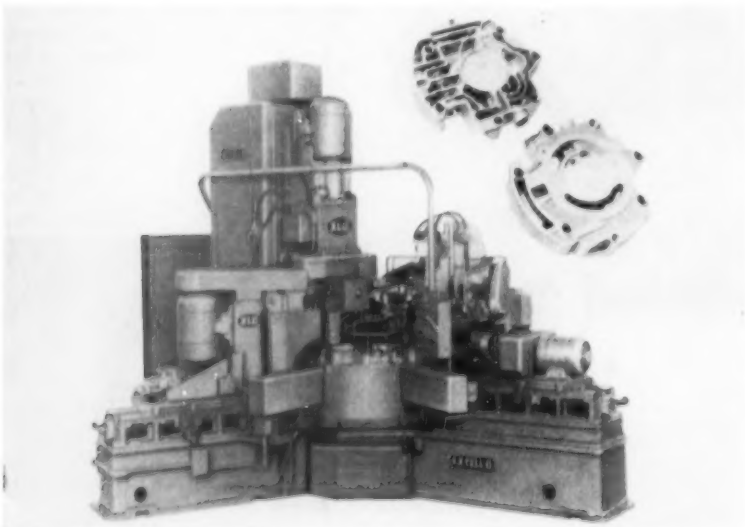
Top-flite heads will drill, bore, tap, or ream up to 12 holes in one stroke in an area up to 18 in. in dia. Interchangeable cluster plates jig-bored to customer requirements replace adjustable arms, reducing setup time. Snap clips on the drive spindles permit rapid change for different hole patterns.

Steel reinforcing band prevents aluminum hood casting from cracking. Alloy steel gears are ball-bearing supported at both ends; driver is supported by Timken roller bearings and designed to compensate for drillpress spindle runout. Lower spindles run in a grease-filled cluster plate, supported by thrust bearings at both ends, with needle bearings to take radial loads. Heads can be operated horizontally, vertically, or at any angle.

Johnson Drill Head Co, 23rd Ave & 20th St, Rockford, Ill



DISK SANDERS AND GRINDERS in Max line have been improved and expanded to incorporate sizes of 24, 30, and 36 in., in addition to previous 16 and 20-in. models. All models are available with single or double disks. As with older "table-on-the-column" models in company's line, additions include two and four-column models for the larger sizes—*Max Mfg Co, 138 Stockton Ave, San Jose 26, Calif*



ALUMINUM REGULATOR-VALVE BODY for an automotive transmission is machined on special unit made up of standard Ex-Cell-O components. Operations include flycutting both flat sides, drilling and reaming two piston holes, drilling three angular holes, and drilling, reaming, and chamfering the top holes. Net production is 120 parts per hour. Machine is equipped with a six-station rotary indexing table; each station has two fixtures, to permit reloading for operations on reverse side of part after first side has been machined. Hydraulic cam clamp retains work through machining cycle—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*

Precision Hole Borer

Developed to meet a need for faster precision boring on repetitive pieces, precision hole borer is reported to be eight times faster than machines using conventional jig-boring methods. Unit holds bore and hole-spacing accuracy within 0.0001 in.

In operation, master or templet is produced with standard-size holes locating the position of all desired finished holes. Templet is mounted on the underside of a fixture which holds work, and a disappearing locating pin in exact alignment with the spindle engages each hole in the templet, so that the master can be reproduced exactly.

Unit is said to handle a wide range of parts and hole requirements, and a complete line of boring bars, collets, drill chucks, and facing heads is available.

Canton Tool Mfg Co, East Canton, Ohio

Handi-Spin adjustable wrench features upper jaw which allows for a secure bite on nut, yet releases bite when pushed upward. Design of upper jaw incorporates a projection which permits wrench to bite into work on downward motion; on upward motion, projection does not interfere with movement of wrench.

Tedd Co, PO Box 1621, Rockford, Ill

Loxswitch limit switches are equipped with watertight plastic cover to permit operator to observe contact action in interior of switch. Seven models and 19 contact arrangements are available. Details in specification sheet L102 PF.

R B Denison Manufacturing Co, 102 St Clair Ave, NW, Cleveland 13, Ohio

How Men and Controls Protect Industry's Confidence in *Carpenter* High Speed Steels

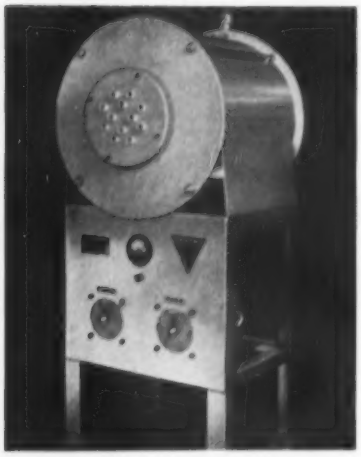
The *performance* you get from high speed steels is directly related to *how* they are produced. As a specialty mill where quality overshadows tonnage . . . and all operations are set to this standard . . . Carpenter devotes the time and attention required to produce high speed steels of the finest quality.

From careful scrap purchasing to guaranteed analysis, and painstaking time and temperature checks during melting . . . through rigid controls of bar reduction in rolling, and many other quality tests at all steps . . . these are the "indispensables" that have enabled Carpenter to produce the finest High Speed Steels for 60 years. And most important is the *personal attention* Carpenter men give to every order. The experience, pride and skill these craftsmen put into the production of every bar make Carpenter High Speed Steels your most dependable investment. Your best proof is to place your next order with Carpenter . . . and see what a difference there *can* be in High Speed Steels. THE CARPENTER STEEL COMPANY, 109 W. Bern St., Reading, Penna.

Every Order of *Carpenter* High Speed Steels Undergoes These and Many Other Quality Controls

- All scrap must be of purest quality, guaranteed analyses.
- Small, electric furnace melting units are used to control quality and uniformity to the highest degree.
- Every heat of steel is constantly checked for chemistry, temperature and melting time.
- Preheat and high heat furnaces are guarded for accurate time and temperature to prepare the steel for rolling.
- Percentage of reduction in cogging billets for rolling or forging of bars is skillfully controlled to assure freedom from internal stresses.
- Discs cut from each bar are acid etched, examined, hardened and fractured to certify internal cleanness, soundness, freedom from excessive segregation. And the hot acid etch is backed by Ultrasonic Testing.
- Slugs are cut from each lot of billets and machined in "step-down" fashion to guard against internal seams, shadow lines, etc.
- Extensive laboratory tests are made for proper hardness, micro-structure, grain size.
- Turning tests are run regularly to check cutting efficiency.
- *For best results, put your confidence in . . .*

Carpenter STEEL high speed steels



Multi-Tube Electric Furnace

High-temperature furnace has been designed for applications where comparatively large quantities of small parts must be sintered under identically controlled conditions. Although initially developed to meet special requirements in sintering of small ferrite parts to a temperature of 2750 F, it is reportedly adaptable to many other ceramic and metallurgical processes.

Unit incorporates 12 pure alumina tubes, each ⅞ in. ID by 30 in. long. Eight silicon carbide heating elements surround the inner bank of tubes. Insulation is of 9-in. graded, super-duty, lightweight type. Power required is 10 kw, 220/60/1; power controls consist of voltage regulating transformer, fine and coarse switches, direct-reading power input ammeter, and magnetic contactor. Temperature controls best suited for specific use of the unit are available.

Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio

3-D Pantograph Engraving Machine

Model SR-3D Panto-Graver, a three-dimensional pantographic machine tool manufactured by Scripta Machines of Paris, France, is designed to do engravings in relief or intaglio, as well as to reproduce die-casting molds and embossing punches.

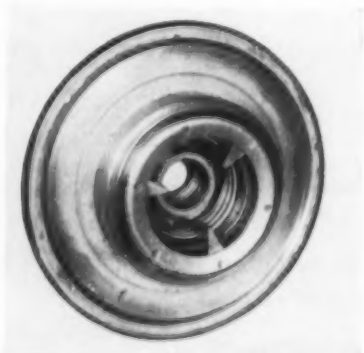
Chief feature of the machine is the parallelogram-type pantograph. One of the arms is extended to carry the stylus, which traces the master and produces corresponding movements at reduced scales of the revolving engraving cutter. Amount of reduction achieved on the work is controlled by two screws. The arms are of aluminum alloy and swivel on ball-bearing joints.

Any type of cutter between 3 and 8-mm diameter (0.118 and 0.315 in.) can be used in the cutter spindle, which is driven through a resilient coupling by a vertically mounted motor. Spindle speed can be varied between 2000 and 12,000 rpm through a built-in motor regulator. Cutter spindle is said to be designed so that cutter run-out can be held to less than 0.0008 in.

Worktable is adjustable vertically by a screw and controlled by a large-diameter vernier scale. The copy-holding table is also adjustable vertically. There is a vertical movement for the pantograph assembly, which is adjustable horizontally for precise positioning of the cutter.

Ratios of reduction on the pantograph are from 1:2 to 1:6, enabling 23 different dimensions to be obtained from one guide. Max work height accommodated is 5.3 in., increased to 16.14 in. with an extra-long vertical column. Several attachments available increase machine's versatility.

Imported by W F Wolf Machinery Co, 2910 Santa Fe Ave, Los Angeles 58, Calif



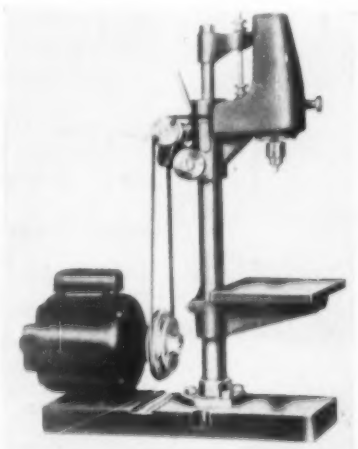
Versatile Gear Chuck

Designed to facilitate the chucking of gears of various types for boring or grinding, Sliger gear chuck also can hold irregular-shaped parts of different kinds. Device reportedly can be adapted to various forms of gears, including both internally and externally toothed gears, with only minor variations in the structure of the parts comprising the chuck.

Device incorporates means for holding sets of three jaws, which are maintained in circumferential and spaced relation by a split ring upon which is mounted a helical spring. To keep jaws normally in forward position, another helical spring is mounted behind jaws.

Gears can be chucked before or after teeth are cut, and bevel gears and pinions can be chucked with teeth toward either front or rear, thus permitting the grinding of tapered holes in either direction. By changing jaws, chuck provides range of from 1 to 5 in. According to manufacturer, chuck will accommodate any pitch or any form of gear teeth without changing jaws, provided it is the same type of gear.

Southern Machine Co, Inc, 1701 Rossville Ave, Chattanooga 8, Tenn



Sensitive Drilling Machine

Class 8 sensitive drilling machine is available with two drives, giving spindle-speed ranges of either 2450, 2815, 3080, and 3540 rpm or 2450, 3630, 4810, and 6000 rpm. Unit drills to the center of a 6-in. circle, has 9/16-in.-dia spindle and spindle feed of 2¼ in. Distance from chuck to base is 14 in. max, chuck to round table 9½ in. Capacity is No. 80 to ¼-in. drills.

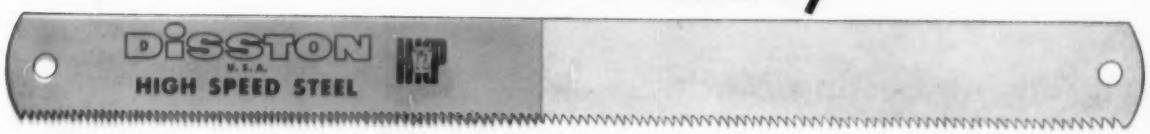
Drill comes with a 5⅝-in. round table. Optional 6 x 8-in. rectangular table overlaps base to form continuous work surface when set up in gangs. Operation is 110v, single-phase. Price of standard model is $225.

High Speed Hammer Co, Inc, Rochester, NY

For easy, economical

machine shop cutting

use one of these 8 sturdy

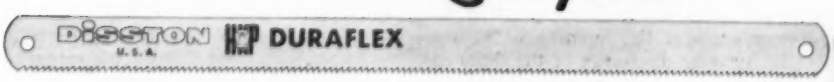


DISSTON HACK SAW BLADES

They cut easily . . . resist

wear and breakage. Get

them through your



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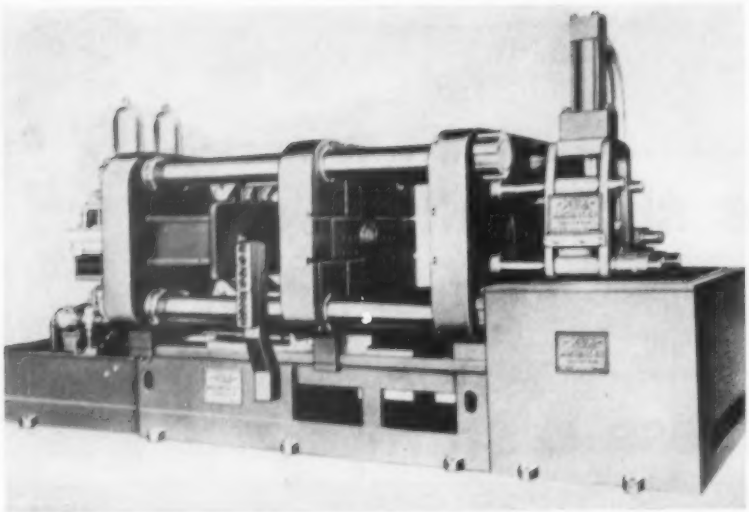
H. K. PORTER COMPANY, INC.
620 Tacony, Philadelphia, 35, Pa.



1000-Ton Die-Casting Machine

Model BH-60 die-casting machine has weight of 79,000 lb, with 10-in.-thick steel die plates, each weighing over 10,000 lb. Die plates measure 72 x 54 in., and provide die space of 40 x 32 in. clearance between tiebars. Die-opening stroke of 24 in. can be adjusted for less stroke if desired.

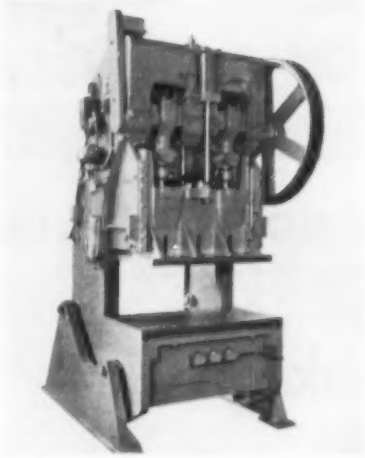
Model is constructed either in a plunger gooseneck design for the production of zinc castings, or as a cold chamber design for making aluminum and magnesium die castings.

Hydraulic system is reported capable of putting the machine through eight free cycles per min with injection pressures up to 32,000 lb psi and injection speeds up to 1000 fpm. Unit can inject up to 49 lb of zinc and more than 14 lb of aluminum into the die, with only movement of pushbuttons required for fully automatic cycle.

Kux Machine Co, 6729 N Ridge, Chicago 26, Ill

Elastomeric-type adhesive for contact and hot bonding, designated EC-1357, can be used for variety of metal and wood applications. Material reportedly has rapid strength buildup rate, high adhesion to steel, high softening point, good sprayability, and excellent resistance to plastic flow. Surfaces to be bonded are chemically cleaned and adhesive is applied with roller or by spraying. Then adhesive is dried with infra-red heat or by air. Heat resistance of material is up to 160 F.

Adhesives & Coatings Div, Minnesota Mining & Mfg Co, 411 Piquette Ave, Detroit 2, Mich



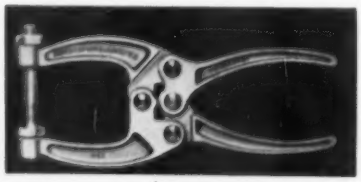
Double-Crank Gap Press

Double-crank open-back gap press is mounted on separate legs so that the body of the press can if desired be set in an inclined position to make use of the open-back feature for gravity discharge of the finished pieces. Standard presses, however, are furnished in the customary upright position.

Press is single geared with single-end drive, and is equipped with an air-operated drum-type friction clutch with spring-loaded brake. Flywheel is fitted with an auxiliary air brake, to bring it to a quick stop when the power is shut off for any reason, and the slide is counterbalanced by air.

Machine has a capacity of 250 tons, stroke of 16 in., adjustment to the slide of 10 in., and pneumatic cushion in the bed with capacity of 42 tons at 100 psi. Bed area is 42 x 72 in., and distance from bed to slide with stroke down and adjustment up is 37 in.

Cleveland Punch & Shear Works Co, Cleveland 14, Ohio

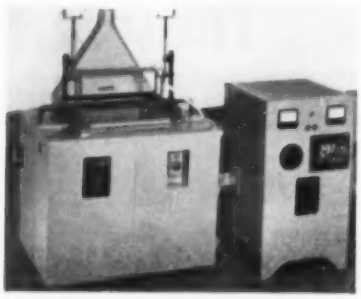


Portable Toggle Clamp Line Includes All-Aluminum Models

Models 441-A and 491-A, made of forged alloy aluminum, are designed for overhead applications, welding operations, and for use in proximity with corrosive chemicals and explosive gases or vapors. Models 441 and 491 are of forged steel construction.

Heavy-duty Models 491-A and 491 measure 10 in. in length, have narrow, deep-throated jaws. Light-duty Models 441-A and 441 measure 6 in. in length, have smaller, but wider and shorter jaws. Details are contained in bulletin 441-491.

Detroit Stamping Co, Detroit 3, Mich



Chromeplating Unit Has Large Capacity

Chromplater Model 300 has a plating tank 15 x 20 x 30 in. deep. It is equipped with two 3000w electric immersion heaters and a heavy-gage steel water jacket to provide accurate control of plating bath through adjustable thermostatic temperature control. Plastisol-covered steel work platform with bus bar supports and acme thread height adjustment is designed for maximum efficiency.

Rectifier, which provides a 300-amp dc output to the plating bath, operates on standard 200v 3-phase 60c ac service connection. Plating unit is 38 x28 x 33 in. high; rectifier is 22 x 40 in. over-all.

Dawson Corp, 302 Fifth Ave, N Pelham, NY

New DynAC® stops motors *instantly*...without a ripple!

Here's dramatic proof of the smooth, controlled braking action of the new Westinghouse DYNAC braking controller. Motor stopped *instantly*—without disturbing the water in the glass goblet. "Grabbing" or jerky stops are eliminated with DYNAC braking.

Wherever rapid and/or controlled stopping is required, DYNAC can not only contribute an important safety factor, but it can save you headaches—*and money*—on: (1) production time, (2) material rejects and spoilage, and (3) maintenance expense.

Because it's *completely* electrical, DYNAC requires no mechanical apparatus or motor linkage—it simplifies maintenance. And it comes in *one* compact, spacesaving enclosure. Get the facts on DYNAC's many cost-cutting applications—with every type of standard induction motor. Use the coupon below for more information on DYNAC. J-30200

YOU CAN BE SURE...IF IT'S

Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION
P.O. Box 868, Pittsburgh 30, Pa.

Please send me descriptive bulletins 15-600 and B-6572 on the new DYNAC braking controller.

Name _____

Company _____

Address _____

City _____ State _____

W-T
WALKER-TURNER

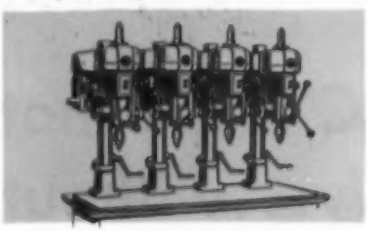
COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

6" Spindle travel means BIG MACHINE capacity in this 15" Drill Press!

You don't have to go to a 20" or larger drill press to get 6" spindle travel. With this 15" Walker-Turner, you can drill holes up to 6" deep at one pass of the drill, in diameters from #60 to ½".

This extra-capacity "LIGHT-HEAVYWEIGHT" is built to deliver fast, accurate production drilling in your plant, 24 hours a day, for a long span of years.

1300 Series — Walker-Turner "Light-Heavyweight" 15" Drill Press — full 6" spindle travel; six spline, full floating spindle; speeds from 480 to 5000 rpm, depending on motor and pulleys; Jacobs Chuck, or No. 1 Morse taper available. (15"



Walker-Turner "LIGHT-HEAVYWEIGHT" Drill Press with 4" spindle travel — 1200 series — also available.)

Ask your Walker-Turner Distributor to *demonstrate* the big capacity of this 15" W-T Drill Press. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and full specifications on these machines.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-Turner

WALKER-TURNER
INCORPORATED
Plainfield, N. J.

NEW SHOP EQUIPMENT

Heat Program Control Timer For Use in Resistance Welding

Unit makes it possible to weld metals that are oxidized or not readily cleaned.

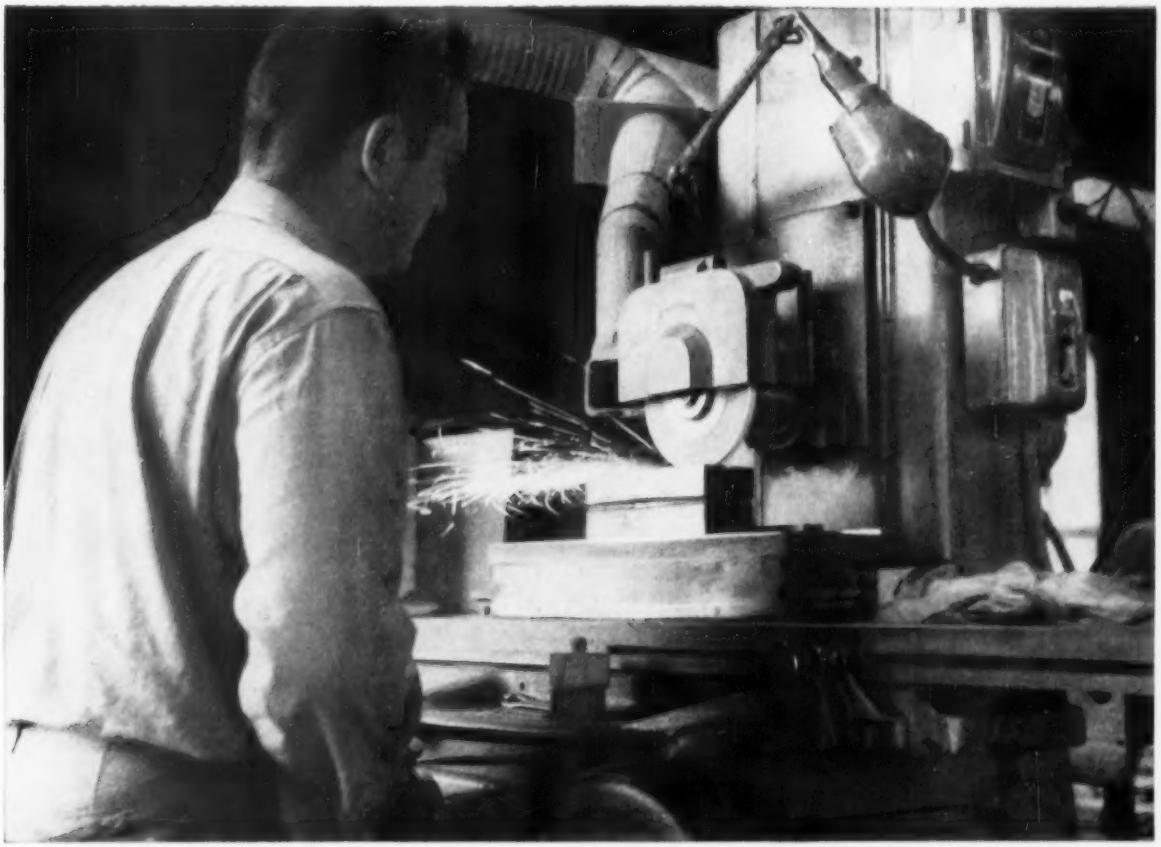
Control supplies welding current in three successive periods. First period conditions the metal surfaces by burning through the coating with increasing current; then, constant current welds the metals; finally, decreasing current anneals the weld. Duration of each may be varied through a heat range of 20-100%. Bench-mounted unit is used with a Raytheon thyratron contactor, may be used with a variety of welding heads.

Raytheon Manufacturing Co, Equipment Marketing Dept, Waltham 54, Mass

Electronic Device Controls Conductivity of Solutions

Designed for simplified use and operation, electronic instrument for controlling the conductivity of solutions is low-cost device for use where recording is not required. Single set-point knob on the front provides control within the range of the instrument calibration. Device is available in two ranges of conductivity—0 to 30 micromhos/cm3 or 20 to 200 micromhos/cm3—for use with conductivity cells having a constant of one.

Accuracy of the instrument is



"5 years ago Cities Service solved all our lubrication problems and we've never had another!"

A report from Banner Spring & 4 Slide Co., Van Dyke, Michigan

These Were The Problems 5 Years Ago: Banner Spring & 4 Slide Company, maker of small parts for the automobile, electrical and refrigeration industries, was having trouble. Ways, bearings, and drive shafts on 4 Slide machines were getting insufficient film strength from lubricants and constantly burning out. Likewise, compressors were also running hot, and there was complete puzzlement over what type of lubricant to use for Banner's high-speed sewing machines.

Banner decided to call in a Cities Service Lubrication Engineer. A thorough survey followed, with the man from Cities Service carefully examining each machine and its particular operating conditions.

This completed, he made his recommendations — Trojan H-2 Multi Purpose Grease for the 4 Slide machines, Pacemaker No. 1 Oil for the compressors, and Pacemaker 00 Oil for the high-speed sewing machines.

Banner followed these recommendations to the letter. Result: Not one lubrication problem in the past five years — despite the fact that machinery runs 24 hours a day!

If you're faced with a lubrication problem — or if you're just not sure if your present lubricant is best for the job — talk with the man from Cities Service. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

SOME BANNER PRODUCTS: The firm makes all kinds of round wire forms, wire springs, metal clips and flat springs. Use for such products ranges from auto fender support rods to "burlap listings"—the wire frames sewn into burlap which back up automobile upholstery.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

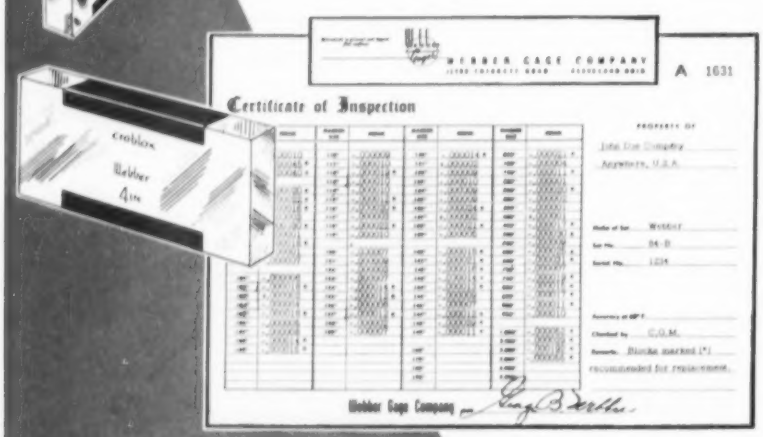
Worn Gage Blocks Cost You Money!

How do you *know* when your gage blocks are worn? By frequent rejects . . . assembly difficulties . . . reduced profits? Pretty expensive! Better play safe by using WEBBER's *periodic inspection service.*

This inspection service includes comparison of your blocks with master blocks certified by the U. S. Bureau of Standards; removal of burrs and nicks which impair accuracy; certification of the degree of wear of each block; and, if you wish, replacement of all blocks worn or damaged beyond repair, with Webber CROBLOX.

Thus, in your Webber-reconditioned set, the blocks which will receive the most use, and hence the most wear, are CROBLOX — solid chrome carbide, one of the hardest, longest-wearing materials known. CROBLOX will out-last by many years the best standard steel blocks!

Webber returns your gage blocks (any make) within 24 working hours after receipt. Inspection costs $18.00 for an 84-block set, less for smaller sets. **Send in your gage blocks *before* production difficulties occur!**



Webber
GAGE COMPANY

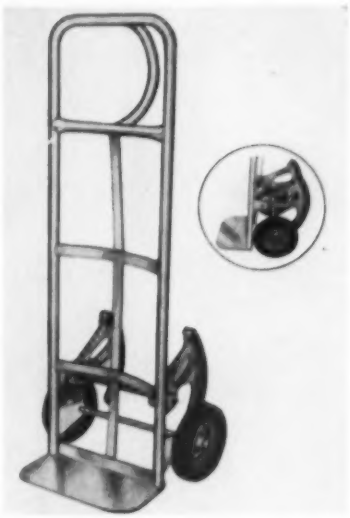
12901 Triskett Rd.
Cleveland 11, Ohio

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

NEW SHOP EQUIPMENT

± 0.5% of full scale, and it has a sensitivity of ± 0.1% of full scale, exclusive of the cell and temperature compensator. In solution temperature changes between 20 F and 100 F, automatic temperature compensation limits maximum error to ± 2% or ± 5% of full scale. Two indicating lights are built into the case to show whether the controlled variable is above or below the setpoint.

Fielden Instrument Div, Robertshaw-Fulton Controls Co, 2920 N 4th St, Philadelphia 33, Penna



Stair-Climbing Truck

Two rocker arms on the E-Z Climber function like an extra pair of wheels. Unit has 1-in.-OD electrically welded tubular steel frame and reinforced base plate beam.

The 9 x 14-in.-wide noseplate is 3/16 in. steel; semi-pneumatic, steel disk wheels are 10 x 2¾ in. Load capacity is 600 lb, shipping weight, 39 lb. Over-all size is 46 in. high, 18¾ in. wide.

Precision Equipment Co, 3716 N Milwaukee Ave, Chicago 41, Ill

Precision balls are available made of wrought SR Steel Alloy No. IIA-1132. Alloy has tensile strength of 95,000 psi and yield strength of 75,000 psi at room temperature, and tensile strength of 63,000 psi at 1200 F. Can be hardened to about 40 R_c, and has non-magnetic austenitic structure. Balls are available in any standard or special size from 1/16 to 6 in. in diameter.

Industrial Tectonics, Inc, Ann Arbor, Mich

NEW SHOP EQUIPMENT

Pressure Pump Oiling System For Bearing Points

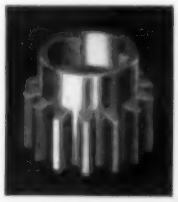
Self-contained oiling system, called Lub-O-Jet, delivers oil under pressure to various points of all types of equipment.

Pressure pump is built into the 4-oz shatterproof reservoir. A 6-outlet distributor is connected to assembly. Flexible, transparent plastic tubing, ⅛ in. OD, is attached to distributor outlets, and runs to the bearing points which can be as much as 100 ft away in any direction. Small amount of oil is fed to all bearings simultaneously each time pump is stroked. All feed tubes remain filled, ready for the next cycle. Details contained in bulletin 36.

Trico Fuse Mfg Co, 2948 N 5th St, Milwaukee 12, Wis

Bench Arbor Press

Model 137-BH bench arbor press has a capacity of ten tons, and is designed to perform such operations as bending, straightening, marking, punching, and removing and replacing gears, bearings, and bushings on



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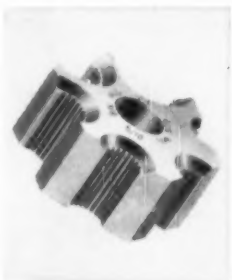
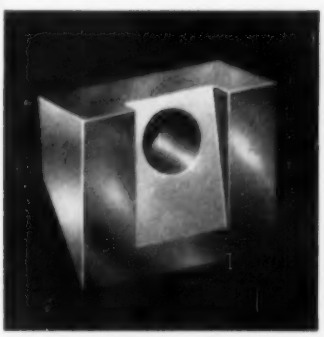
...the best and most modern!

Bunting today covers a new area in the engineering and manufacture of bearings and machine parts. To the traditional line of Bunting Cast Bronze Bearings and parts is added up-to-date, soundly established facilities for engineering and manufacturing bearings and parts made of Sintered Powdered Metals.

In an entirely new plant with the very latest equipment, Bunting now attains the position in the Sintered Powdered Metals field which it has long held in the field of Cast Bronze Bearings.



A competent group of Bunting Sales Engineers in the field and a soundly established Product Engineering Department put at your command comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.



Write to our Product Engineering Department in Toledo, or consult our nearest Sales Engineer.

Bunting®

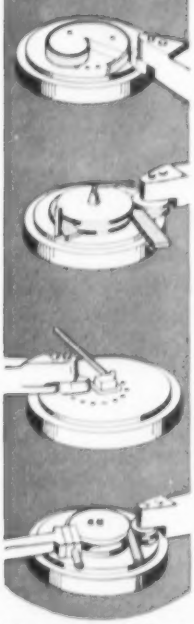
BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

"it's easy to bend"

a new 32 Page
BENDING MANUAL

by the originators of "Die-less Duplicating"



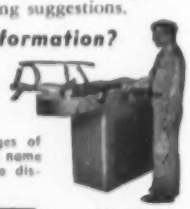
This instructive and authoritative booklet will quickly prove itself indispensable wherever bending is done or is needed. It brings you a veritable gold mine of tested authentic bending methods applicable to any rotary type bender. The proper bending technique may frequently offer a new approach to an old problem by simplifying product design and cutting production costs.

The exact methods of producing various types of bends in a wide range of materials are illustrated, step by step, with over 90 diagrams and charts together with valuable tooling suggestions.

Want More Information?

New catalog gives complete details on all hand and power operated Di-Acro machines.

Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write us.



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ONEIL-IRWIN, 311 8th Ave., Lake City, Minn.
PLEASE SEND 32-PAGE BENDING MANUAL

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Company_____

Address_____

City_____ State_____

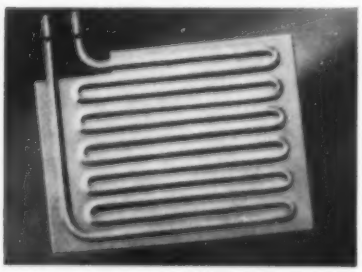
NEW SHOP EQUIPMENT

motor shafts and other equipment.

Press features release valve which gives "fingertip" ram control, in addition to self-contained hydraulic cylinder. Hydraulic stroke is 6¾ in., and maximum daylight opening is 12 in.

Bulletin 104.

K R Wilson, Inc, Arcade, NY



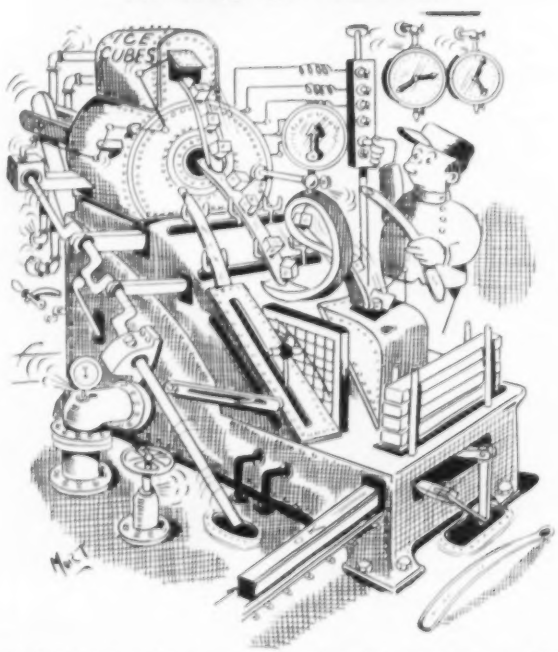
HEAT TRANSFER UNITS called Platecoils are designed to replace pipe coils in industrial processes requiring the application or removal of heat. Units consist of two embossed metal sheets welded together to provide a preformed channel for the flow of heating or cooling media. Style 50 Platecoil is available in 18- or 22-in. widths, and in lengths from 23 to 119 in. Over-all thickness is ⅞ in. Metals available are cold-rolled steel, stainless steel, and other alloys for corrosive solutions — *Tranter Mfg, Inc, Lansing 4, Mich*

Micrometer-Stop Driver Takes Stub-Taper Tools

Micro-stop driver adapted for use with standard stub-taper combined drill and countersink is available with straight or taper shank, and can be used in drillpresses, lathes, and hand drills.

In operation, the adjustable sleeve of the driver contacts the work first. Combined drill and countersink is then fed against light spring pressure until the feed is stopped posi-

MACHINES OF TOMORROW



Semi-Automatic three-ton Extruder for manufacturing and testing the curvilinear (curves) and non-adhesive (slipping) qualities of the modern 12-16 inch king size shoe horn designed for the non-bending carriage trade by the Podiatry Plastic Foundry Co.

Whatever kind of gears you make...
Whatever way you make them

National Tool Co.

can supply the right type cutting tool
because we make *all* types

Gear Shaving Cutters

Hobs

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.

Rack Type Gear Shaper Cutters

Involute Gear Cutters

Herringbone Gear Cutters

Gear Shaper Cutters

Master Gears

1905 • 1955 Over 50 Years

National
TOOL CO.
Cleveland 7, Ohio

Representatives in major industrial centers

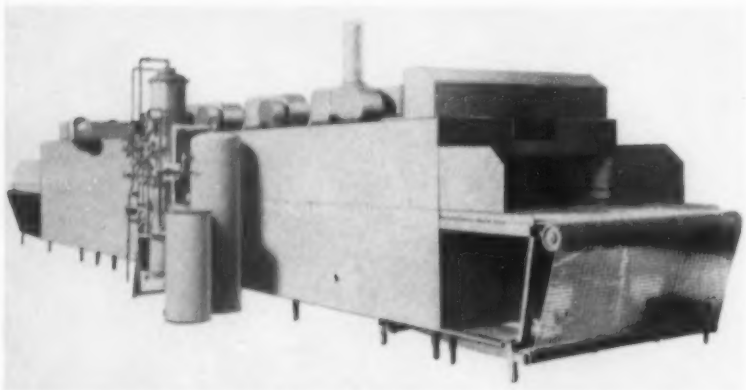
tively at a depth that can be preset in 0.001-in. increments, by adjusting the driver sleeve.

Cogsdill Twist Drill Co, Detroit 21, Mich

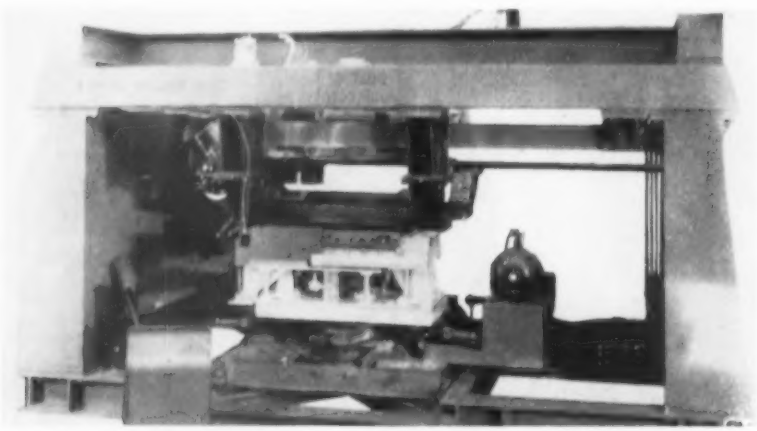
Level, with built-in, permanent magnets, called Magno-Level, holds securely on ferrous metals at any angle on either flat or curved surfaces, eliminating use of hands. Plastic dial gives reading, indicating angles from any angle. Aluminum device weighs 10 oz, measures ¾ x 1⅞ x 9 in. Price $9.95.

Richards Merchandising, Inc, 2424 Euclid Ave, Cleveland, Ohio

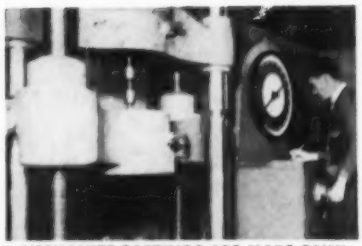
Hardened bars designated "60 Case" are intended for use as guide rods, shafts, rolls, piston rods, and axles. Material is AISI 1060 steel which



AUTOMATIC WATER WASHER for cleaning of metal parts provides a continuous, straight-line work flow through the cleaning process, preparing parts for finishing operations or packaging as they come off the conveyor belt. Washing process consists of a series of cleaning stages, including rinsing with de-ionized water so chemically inert it is said to be equal to water that has been triple distilled. In prior washes an alkaline-base detergent or acid is used to remove grease, grit, or dust; tap-water rinses and drying cycles follow. Washer is designed so that washing solutions and rinse water can be re-used. Each unit is designed for requirements of individual purchaser—*Stoelting Bros Co, Kiel, Wis*



REFRIGERATOR INNER LINERS are produced by special resistance welder which produces a completely welded liner in one operation. Liners require only three mash-seam welds in this operation, compared to six seam welds required in previous liners. Total of eight operators is required on liner line, in contrast to twenty previously required. Two-thirds of welder output is sufficient to maintain production rate of 90 assemblies per hr. Welder features dual welding heads which make series and indirect welds. Back and bottom welds are simultaneously welded with overlap to produce gas-tight corner welds. Welding mandrel rotates 90° to facilitate loading and unloading—*Taylor-Winfield Corp, Warren, Ohio*



MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machine Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundry Co., Chicago, Ill.
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Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
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Shenango-Penn Mold Co., Dover, Ohio
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Valley Iron Works, Inc., St. Paul, Minn.
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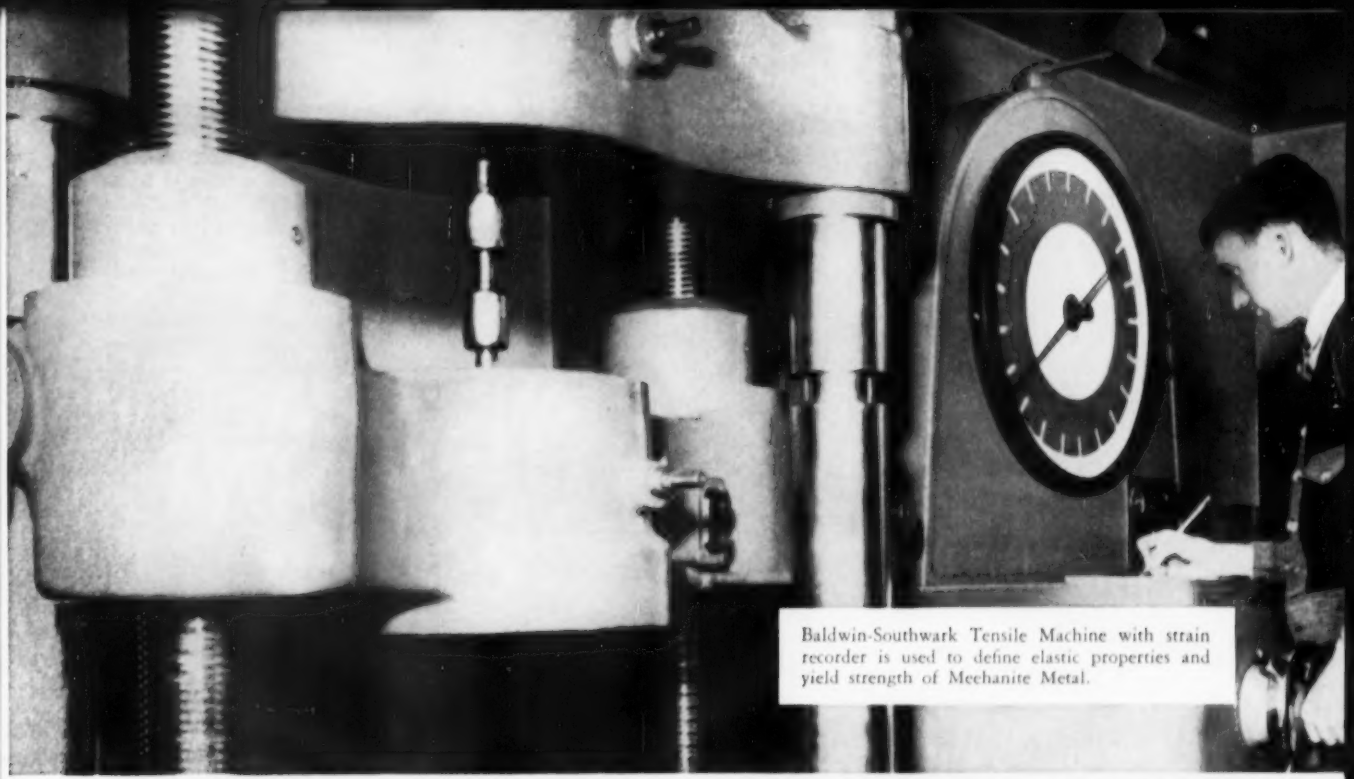
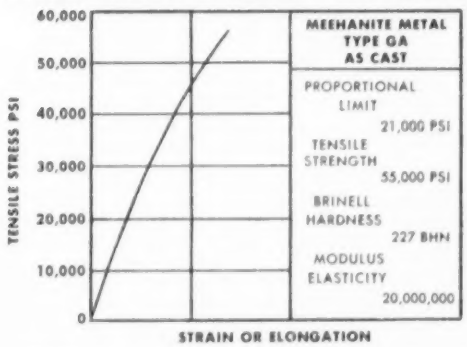
Write today to Meehanite Metal Corporation, Dept. 4D, 714 North Avenue, New Rochelle, N. Y.

MEEHANITE®



Baldwin-Southwark Tensile Machine with strain recorder is used to define elastic properties and yield strength of Meehanite Metal.

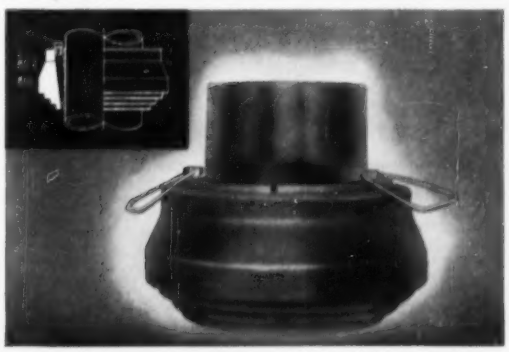
MEEHANITE CASTINGS POSSESS TRUE ELASTIC PROPERTIES AND ARE MADE TO RIGID ENGINEERING SPECIFICATIONS



Meehanite Metal has a controlled microstructure, consisting of uniformly distributed graphite in a fully pearlitic matrix, which is comparable to that of a normalized spring or tool steel. This structure, the result of a unique manufacturing process based upon proven metallurgical techniques, assures good tensile properties in association with high yield strength and elastic modulus. These properties are of paramount importance in the selection of engineering materials since they aid in defining the useful characteristics of Meehanite Metal in service.

For information, write today for Bulletin 32 — Physical Properties of Meehanite Castings — and Bulletin 43 — Meehanite Castings for Pressure Tightness.

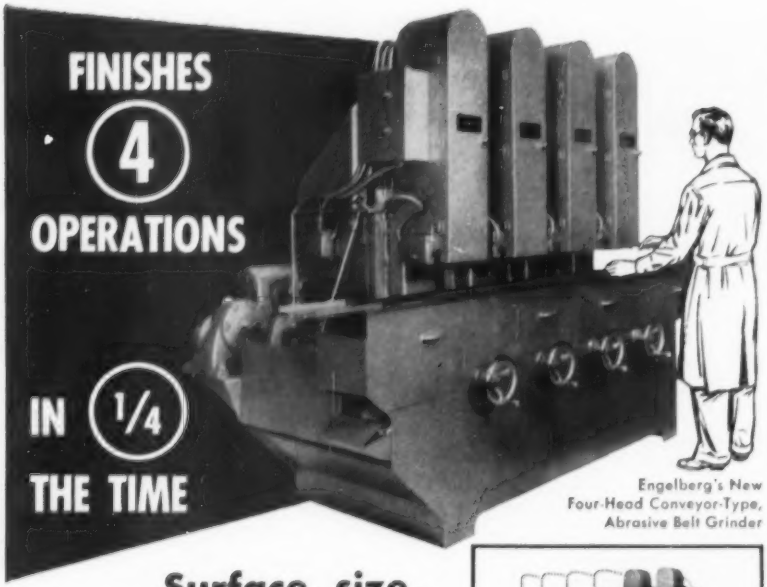
Power-Twin hydraulic pullers of 17½, 30 and 50 ton capacities manufactured with Meehanite ram body castings tested to 24,000 psi. The 30-ton unit needed an applied load of 87 tons before failure.



Meehanite casting support (KC-1) to hold tapered slips (KC-2) is subjected to downward pressures of up to 150,000 lbs. in oil well drilling. No evidence of failure under loads up to 210,000 lbs.

MEEHANITE METAL®

MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK



Engelberg's New Four-Head Conveyor-Type, Abrasive Belt Grinder

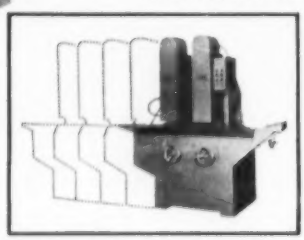
Surface, size, Semi-finish, Fine Polish . . . in ONE Pass!

Talk about high speed production. You will — when you see Engelberg's new multi-head conveyor-type abrasive belt grinder precision size and fine finish *any* ferrous, non-ferrous, plastic or other flat surface. *With one machine — one operator — and one pass* — you can now complete *four* different grinding and polishing operations.

Think of the costs you can slash on high-volume runs. Think of the time you can save on set-ups and changeover. And the initial cost is far less than you'd have to pay for separate machines.

SEND SAMPLE PART TODAY for cost-and-time-savings estimate. Or if more convenient, an Engelberg Production Engineer will be glad to discuss your grinding problems. No charge — no obligation, of course.

ENGELBERG
HULLER CO., INC.
186 Seneca St. Syracuse, New York



Choice of 1 through 6 grinding heads with 6", 8", 10" or 12" belt width.

Parts Finished in ONE Pass

Chain Saw Bars — 4 head operation removing .004" per head for total .016" per pass.

Roger Dean FORD

Name Plate — 3 head operation using #240, #320 and #500 grit abrasive belts with conveyor belt speed of 14' per min.

Skate Blades — 5 head operation using #120, #180, #240, #320 and #500 grit abrasive belts at 12' per min. conveyor belt speed.

Rubber Tile — 3 head operation using #240, #400 and #600 grit abrasive belts with conveyor belt speed of 21' per min.

NEW SHOP EQUIPMENT

has a surface hardness close to R_c 60 and is precision ground to standard diameters. Maker reports that method used to harden bars reduces warpage to a minimum. Initial standard sizes range from diameter of ¼ to 4 in. Maximum length varies from 8 to 14 ft, depending on the diameter. Depth of hardness ranges from 0.040-in. minimum in the smallest diameter to 0.100 in. in the largest.

Thomson Industries, Inc, Manhasset,

Heavy-Duty Conveyor

Portable conveyor designed for handling heavy loads is equipped with wire-mesh belt which is said to accommodate such hard-to-handle pieces as hot forgings, heavy objects with slick surfaces, and awkwardly shaped objects.

Unit comes equipped with casters and handles placed on each side, so that conveyor can be tilted and rolled from job to job. Wire-mesh belt is available in a variety of weaves, and with any spacing and size of flight. Motors in all standard voltages can be obtained.

Conveyors are available in a number of standard sizes.

Cooney Industries, Inc, 17245 E 10 Mile Rd, East Detroit, Mich

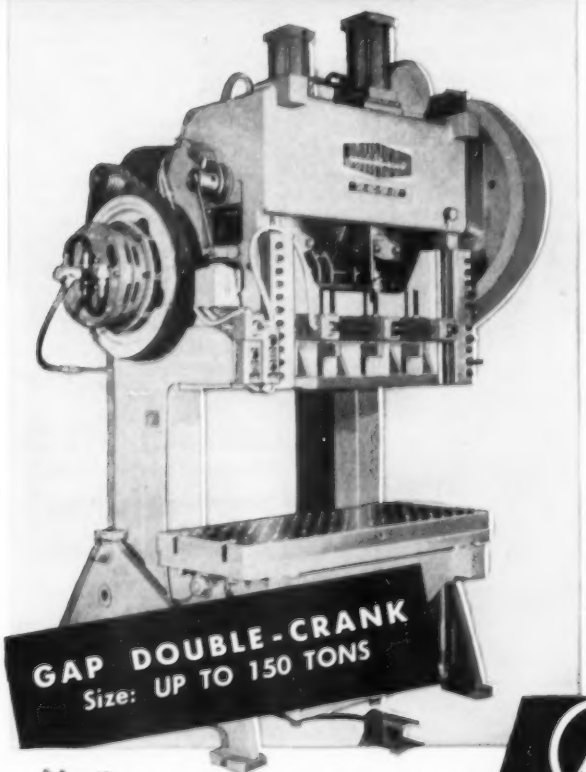
Automatic buildup wire for use with submerged-arc process responds to heat treatment and can be applied to all ordinary AISI and SAE steels, has high impact strength and good wear resistance. Wire is designed for use prior to final hardfacing on parts such as tractor rollers and idlers, cable drums, and large shovel parts. As a buildup with no final hardfacing, it is recommended for the restoration of track rails and links, large shafts, and pulley sheaves.

Air Reduction Sales Div, Air Reduction Co, 60 E 42nd St, New York 17, NY

JOHNSON

INTRODUCES

TWO NEW SERIES of PRESSES



- Box Type Ram
- Steel Fabricated
- Air Clutch (low inertia)
- Electrical Controls
- Bronze Gibs and Ball Seat
- Air Counter Balance

Write for Bulletin 1956

Also 22 MODELS OF OBI MECHANICAL PRESSES from 16 to 125 Tons Capacity

Johnson MACHINE and PRESS CORP.

620 WEST INDIANA AVENUE • ELKHART, INDIANA

See how
LINDNER
JIG BORER
direct-reading micro-optical measuring system with "Autopositioner"

speeds initial and repeat table settings-guaranteed accurate within .00015"

readings in .00005" no gauges, blocks or bars

table sizes
44" x 24"
32" x 16"

SEND for 25-minute movie film demonstration

KURT ORBAN COMPANY, INC.
36 Exchange Place
Jersey City 2, N. J.
In Canada:
2490 Eglinton Ave. W. Toronto

NEW SHOP EQUIPMENT

Portable Metal Hardness Tester Reads in Rockwell or Brinell

Device provides direct readings corresponding to Rockwell A, B, or C scales, or Brinell medium or low scales. Unit can be used for practically any size, shape, or type of metal.

Design eliminates base-plate or pressure-screw clamp attachments, and need for conversion charts or calculations. Direct reading can be made in seconds, according to manufacturer, by placing tester on the metal, pressing handgrips down, and reading the dial. Each instrument is individually calibrated to ±1.5 pts Rockwell and 5 pts Brinell. Unit is furnished with diamond penetrator and one test block packed in a wood case.

Newage International, Inc, 222 York Rd, Jenkintown, Penna

Screwdrivers, No. 2000 line, incorporate a green Cushion-Core in the plastic handle, designed to increase resistance to pounding. Plug stops blows at end of blade where force of impact is otherwise directly transmitted to handle. Available in range of styles and sizes.

Stanley Tools, 111 Elm St, New Britain, Conn

Standard Line of End Mills For Aluminum and Its Alloys

Two-flute standard end mills, specifically designed for machining aluminum or aluminum alloys, are

The Good in our slogan

J. G. Sorensen

CHAIRMAN, THE CINCINNATI GEAR CO.

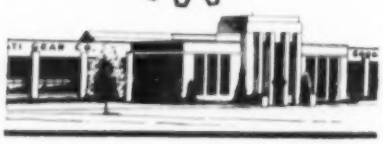
Our slogan, "Gears . . . Good Gears Only," seems almost unpretentious by modern standards. In this day of soaring advertising superlatives and grandiose claims of product superiority, we feel it sounds a little old-fashioned—and that's just the way we want it.

There is little about our production today, from a technological stand-point, that resembles our operations of even a few decades ago. New modern machinery in an ultra-modern plant has enabled us to offer a degree of precision and efficiency undreamed-of in our fathers' time. But, while we've striven to be second to none in utilizing the advancements made possible through technological progress, we've also attempted to retain something of the old-fashioned craftsmanship and pride of workmanship that is all too often lost in the modern shuffle of mass production.

We specialize in just one thing: the manufacture of the best custom gears that can be produced. To our modern production techniques we add this old-fashioned ingredient of craftsmanship; the result is just what is promised in our simple slogan: we produce *good* gears, and good gears *only*. This simple claim is backed by our reputation — we *deliver* good gears only. It's a claim and a reputation we intend to perpetuate for many years to come.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
"Gears—Good Gears Only"

CINTI



New Literature AVAILABLE

Now! Closer gage block tolerances give you up to 75% longer wear life at no increase in price!

Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", —.000002" per inch of length, with flatness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004", —.000002" per inch of length, with flatness and parallelism held within .000004".

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

Set No. 35 R: "W"—$195.80, "I"—$280.50

Set No. 81-SA: "W"—$545.60; "I"—$764.35

ELLSTROM STANDARDS DIVISION
DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

- Ellstrom Internal Setting Gage—12" range: $185.00
- Ellstrom Rectangular Gage Block Accessory Set: $288.95
- Ellstrom Master Sine Bar "W" Accuracy: $112.50 "I" Accuracy: $152.75

available in a range of diameters from ¼ to 2 in. in the three popular flute lengths. Other diameters and lengths can be furnished when required.

Brochure provides catalog numbers, dimensional data, and prices.

Putnam Tool Co, 2981 Charlevoix Ave, Detroit 7, Mich

Thread Rolling Heads

New Series N Acme-Fette design self-opening heads has been introduced by National Acme Co.

Units may be used in either rotating or non-rotating holding spindles and are designed for use on almost any type of lathe, automatic, threading machine, drillpress, or similar equipment. When used as a non-rotating head, opening is by pull-off method with resetting by hand-lever; as a rotating-type head, operation is by outside yoke. Series includes four head sizes covering capacities from 1/16 to ¾ in.

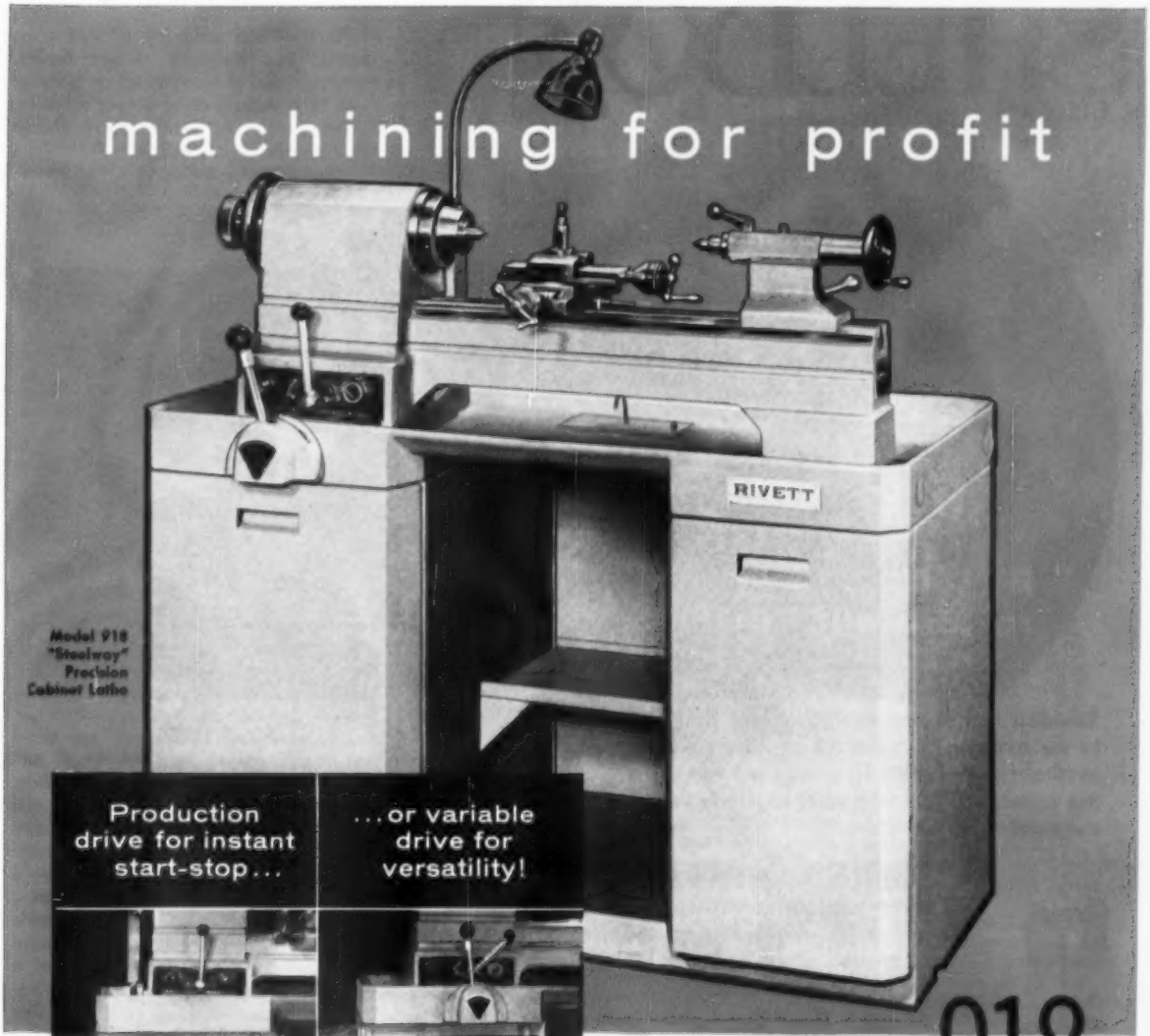
National Acme Co, 170 E 131st St, Cleveland 8, Ohio

Tube and rod bender available in three models may be mounted on truck, workbench, 4-in.-or-larger vise, or metal stand. Unit bends steel flat bar up to 2½ by ½ in.; round and rectangular steel and reinforcing steel bars up to 1 in.; steel pipe from ¼ to 1¼ in.; and steel, aluminum, and copper tubing up to 1⅝ in.

J B Sebrell Corp, 300 S Los Angeles St, Los Angeles 13, Calif

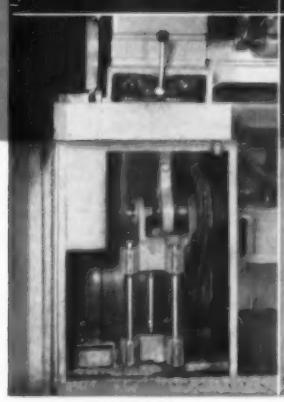
Miniature load cells, SR-4 Series, for electrical measurement of forces and weights up to 10,000 lb in compression, have been developed for use where space is severely limited. Cells are less than 2 in. in dia and only 2¾ in. high. Cells are not intended to replace larger cells of same

machining for profit

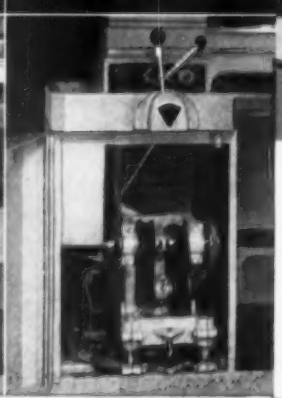


Model 918 "Steelway" Precision Cabinet Lathe

Production drive for instant start-stop...



...or variable drive for versatility!



RIVETT 918

earns money—produces at rates to permit surpassing your competition!

RIVETT

Use a modern lathe—consistent in size with the work to be done. Gain advantage of time-saving features—to reduce operator effort, lessen time between set-ups, permit a faster rate of production!

The Rivett 918 offers this opportunity. Many shops are taking advantage of it. Why don't you?

Write for Bulletin 918-SLB and see →

RIVETT LATHE & GRINDER, INC.—DEPT. AME-6, BRIGHTON 35, BOSTON, MASS.

SHELDON

CHICAGO U. S. A.

BUILT to turn out PROFITS

Sheldon Lathes are designed and built to do accurate lathe work rapidly and profitably. Moderate in price they have the collet, swing and power capacity to do most toolroom work.

UM56P
$1615.00
BASE PRICE
F.O.B. CHICAGO

Design Features:

- **Large and wide "Zero Precision" Tapered Roller Spindle Bearings**—permit operation at all speeds, retain accuracy, end expensive bearing maintenance costs.

- **54-pitch Gear Box**—gives both standard and many hard to get thread ratios.

- **Large Micrometer Dials**—Make accurate operation easier.
- **Extra Collet Capacity**—1⅜" hole through spindles available on 10", 11" and 13" swing lathes.

- **More Power to Spindle**—Efficient drives with bigger **motors** and **double neoprene** V-belts to spindle.

OPTIONAL FEATURES AT EXTRA COST include: Hardened ways, Long Tapered Key Drive Spindles, 4" D1 Camlock Spindles, bed turrets, collet attachments, and other production and toolroom accessories. Lathes available with a choice of "Bench," "Cabinet" or "Pedestal" mountings.

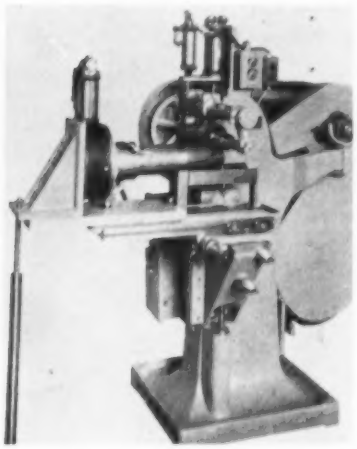
Write for New Catalog G-55

SHELDON MACHINE CO., INC.
4233 N. KNOX AVE. • CHICAGO 41, ILLINOIS

NEW SHOP EQUIPMENT

capacities and accuracy of measurement, but measure thrust forces where space is too limited to permit use of standard cells. Small sizes of special cells are provided at a sacrifice in side-load sensitivity.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Penna



105-MM PROJECTILES are machined on No. 1 milling machine, which has been adapted for the semi-automatic stake notching of the projectiles on a production basis. Head of the machine is equipped with a 4-in.-stroke air-hydraulic feed which provides rapid traverse approach, controlled cutting speed and distance, and automatic rapid return. Work is held in a cup-type collet secured to the center of a pneumatic rotary table with a five-division index plate. In operation, five notches are milled in the work. Cost of each machine, completely equipped, is $3000. Automatic feeding attachments are available—*U S Burke Machine Tool Div, Cincinnati 27, Ohio*

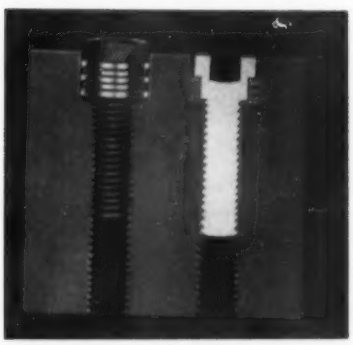
Small stroboscope unit, called Labstrobe Model 18-A, is the same size as a standard two-cell flashlight. Device gives 60 brief flashes of light per sec when connected to 60-c power line, uses a standard neon bulb. Useful for checking speed of rotation of motors and machines, tool is housed in a chromium-plated case. Cost is $9.95.

Berkshire Laboratories, 878 Bank Village, Greenville, NH

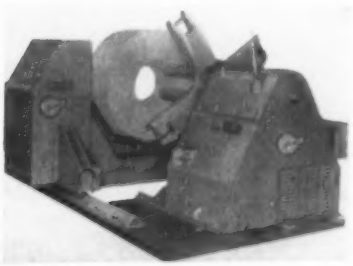
Abrasive media for barrel finishing, Speed-D-Burretts, is a special compound of synthetic rubber and aluminum oxide. Media is made by kneading aluminum-oxide grain or grit into raw rubber, after which it

is then molded, formed, or rolled to a diamond, rectangular, ball, or square shape and cured to a precise hardness. Material is available in a wide range of sizes and grits, and is reported especially adaptable to finishing of delicate, precision parts.

Speed-D-Burr Corp, 3613 San Fernando Rd, Glendale, Calif
0815X



SCREWS called Saf-Lok feature an expansion insert, are made in a complete line of socket shoulder screws (stripper bolts) and flat-head socket screws as wells as cap screws. Screws are said to be leakproof and never to vibrate or shake loose when drawn up tight. Devices fit standard counterbores and, with larger inserts, oversized counterbores as well. After being drawn hand-tight, screw is tightened with a key, causing expansion insert to spread and fill cavity—*Safety Socket Screw Co, 6501 N Avondale Ave, Chicago 31, Ill*



POWER-LIFT COIL LOADER, called the Sesco Lift Loader, is mounted on rails, permitting lateral movement for loading of coil. Coil is elevated to obtain core alignment and then is transferred laterally onto the expander arms of the centering reel. Both lateral and vertical movements of coil are by electrical power pushbutton-controlled. Model illustrated is designed for loading a single coil, but machine can be built to handle multiple coils and to handle coil weights up to 40,000 lb.—*Sesco Inc, 8881 Central Ave, Detroit 4, Mich*

THIS WILL CURL YOUR EYELASHES

A Nilson 22 Four-Slide Automatic Wire Forming Machine is being used by Rollash Corporation, Brooklyn, N. Y., to form wire as shown for their eyelash curler . . . complete in one operation. After one year's operation they report savings of—
40% on actual manufacturing costs
15% on improved tooling which eliminates secondary operations.
10% on fewer rejects, full parts control assuring top precision.
. . . elimination of freight charges by making parts on premises, advantage of immediate access to production.

TOTAL SAVINGS . . . OVER 65%

NILSON 4-SLIDES FEATURE

- One-man operation
- Forming of wire or ribbon metal from coil
- One fast, automatic operation straightens, feeds, pierces, blanks, stamps or coins, cuts off, forms
- Critical tolerances up to .002" on any runs
- Fast tool and die changing
- Wide size range—forms wire up to ½" dia. in feeds to 32" max. Ribbon stock up to 3½" wide
- Press sections 5 to 30 ton cap.
- Heavy duty models 50—75 ton cap.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogs . . . the first step in increased production.

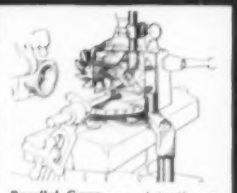
A.H. NILSON MACHINE COMPANY

1519 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.

Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.

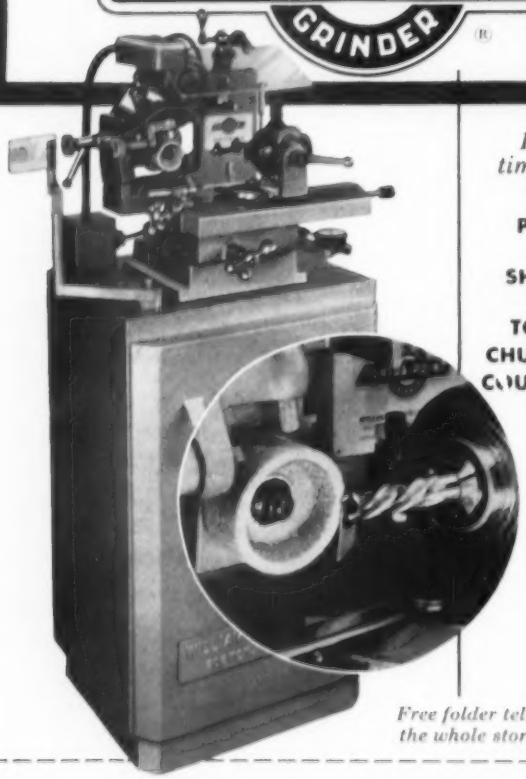


Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

Here is a completely NEW method for grinding helical cutters...

It's name is

END MILL **CENTRA-POINT** GRINDER ®



It can save you time in sharpening

END MILLS
PLAIN MILLING CUTTERS
SHELL END MILLS
STAGGERED TOOTH CUTTERS
CHUCKING REAMERS
COUNTERBORES, ETC.

CENTRA-POINT'S new ball bearing carriage and workhead allow sensitive movement necessary for following helixes of small milling cutters.

Free folder tells the whole story

CENTRA-POINT DIVISION
William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

Please send the complete CENTRA-POINT story, at no obligation.

Name _____ *Title* _____
(Please print)
Company _____
Address _____
City _____ *Zone* _____ *State* _____

Cone-Loc Drum Sanders Cushioned With Neoprene

Cone-Loc Drum Sander is a split drum wheel that permits use of ordinary strips of abrasive torn off abrasive rolls, eliminating need for more costly endless belts or clipped end strips.

All sizes are now available cushioned with neoprene rubber, resistant to oils, grease, and similar products used in connection with buffing, grinding, or polishing operations. Sanders can reportedly be run in these liquids without swelling or softening effect on cushioning.

American Diamond Saw Sales, 120 N W Ninth Ave, Portland 9, Ore

Precision tube cutter automatically or manually cuts metal tubing to any desired length, with accuracy in thousandths. Machine will cut ferrous and non-ferrous metals up to 4-in. diameter. Precious metals are funneled into a scrap drawer for easy recovery. Because cutoff produces little or no burr, parts can frequently be assembled without secondary deburring operations.

Rhode Island Engineering & Mfg Corp, 8 Water St, Providence, RI

Diamond powder compound, designated Diadem, consisting of diamond particles in a permanent viscous suspension, is now packaged in 5g Bracon squeeze tubes of clear polyethylene plastic. Micron sizes are identified by a color code; corresponding color of compound is matched by tube cap.

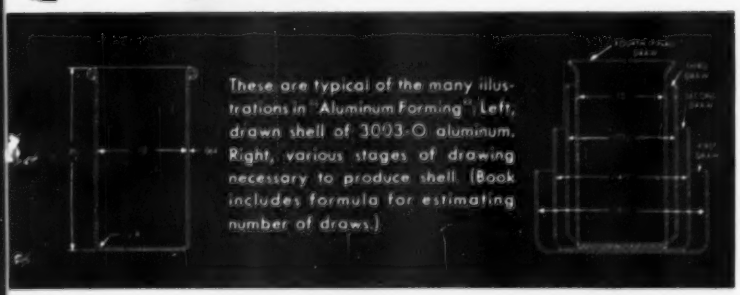
Bradley Container Corp, Maynard, Mass

Powder-metal, low-hydrogen electrode, known as Strikeasy LH-2, is claimed to be faster in lineal speed by up to 30% than conventional low-hydrogen units. Product, which

KNOWING HOW

...often means Savings and a Better Product

...this handbook "ALUMINUM FORMING" gives complete information on aluminum techniques



These are typical of the many illustrations in "Aluminum Forming". Left, drawn shell of 3003-O aluminum. Right, various stages of drawing necessary to produce shell. (Book includes formula for estimating number of draws.)

Everyone who works with aluminum should have this 148 page handbook from the Reynolds library of technical handbooks. "Aluminum Forming" was published so that product designers and plant supervisors could have, in a single volume, complete information on the proper techniques for bending, forming and drawing aluminum. Design and fabricating practices with aluminum are not always exactly like those for other metals. In some cases modifications or even special procedures may be required. This handbook fully explains all these procedures and includes more than two hundred and thirty drawings and photographs, twenty-two tables and thirty-two formulas.

Single copies of the valuable Forming handbook are free when requested on business letterhead (otherwise the price is $1.00). A complete index of Reynolds technical literature is also available. *Reynolds Metals Company, P.O. Box 1800-JJ, Louisville 1, Kentucky.*

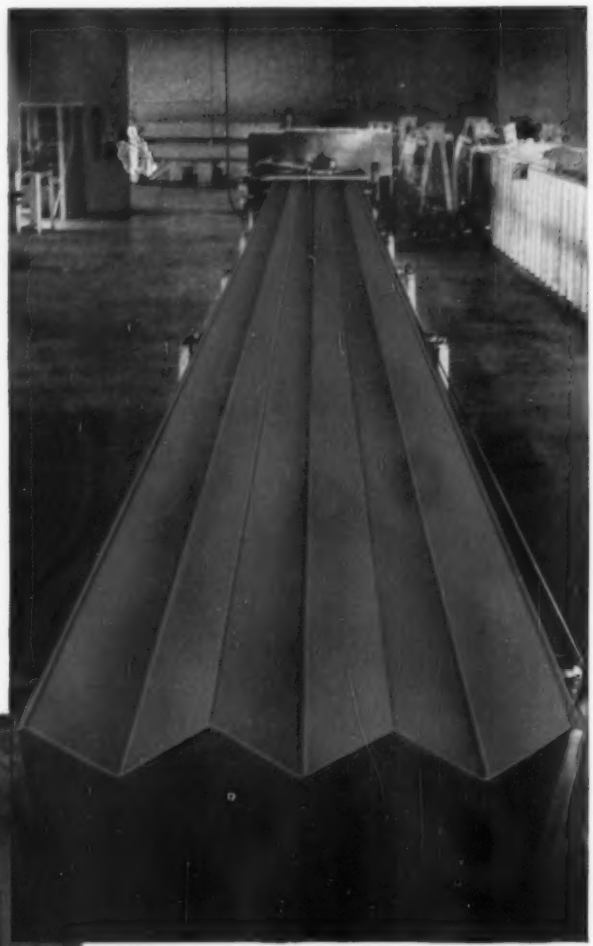
See "Frontier", Reynolds exciting dramatic series — Sundays NBC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

The Brauer Structural Panel of

ROLL-FORMED ALUMINUM

for greater strength, more uses, better appearance, easier maintenance



Roll forming machine, developed by Brauer Engineering Company, produces up to 3,500 feet of panel material per hour.

Structural aluminum panels developed by the Brauer Engineering Company, Corpus Christi, Texas, have been used in everything from garages to a church. And in every application the characteristics of strong, lightweight and rust-free aluminum have offered special advantages.

Rolled from 48″ wide, .040″ thick, 3003-H14 aluminum sheet, they are 40 inches wide and four inches deep when formed, and can be made to any desired length. Weight is only 0.69 pounds per square foot, yet a ten foot section will carry about 88 pounds per square foot uniform load at yield point. In application this eliminates at least half of the structural members.

Brauer also manufactures complete construction accessories for these panels adaptable to any type of building. A special groove at the top edge of the panels prevents side lap leakage, permitting construction of minimum pitch and even flat roofs without use of additional roof covering material. Since aluminum reflects 90% to 95% of radiant heat, these building panels provide their own insulation even though inside finishing materials are not used.

If your problems, like Brauer's, involve forming, you should own Reynolds highly informative 148-page handbook, "Aluminum Forming". Single copies free when requested on business letterhead. Ask also for complete literature index. Or you may want to work with the men of Reynolds Styling and Engineering Services. Write *Reynolds Metals Company, P.O. Box 1800 JJ, Louisville 1, Ky.*

More information on next page ▶

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

See "FRONTIER", Reynolds exciting dramatic series, Sundays, NBC-TV

meets mechanical requirements of AWS Class E-7016, is recommended for use with dc reverse current, can also be used with ac current. Ultimate tensile strength, as welded, is rated at 80-83,000 psi, yield strength at 70-73,000 psi with elongation of 34% in a 2-in. specimen.

General Electric Co, Welding Dept, Schenectady 5, NY

Crescent-type hand wrench called Auto-Grip features pushbutton which can be pushed along handle to adjust jaw opening. Tool is made in sizes of 6, 8, 10, and 12 in. Wrench can be adjusted up to 15/16 in. by light pressure on button; once pressure is released, wrench locks in firm position. Bearings are made of nylon, with resulting lower friction while in use.

BMS Enterprises, 5512 Dyer St, Dallas, Tex

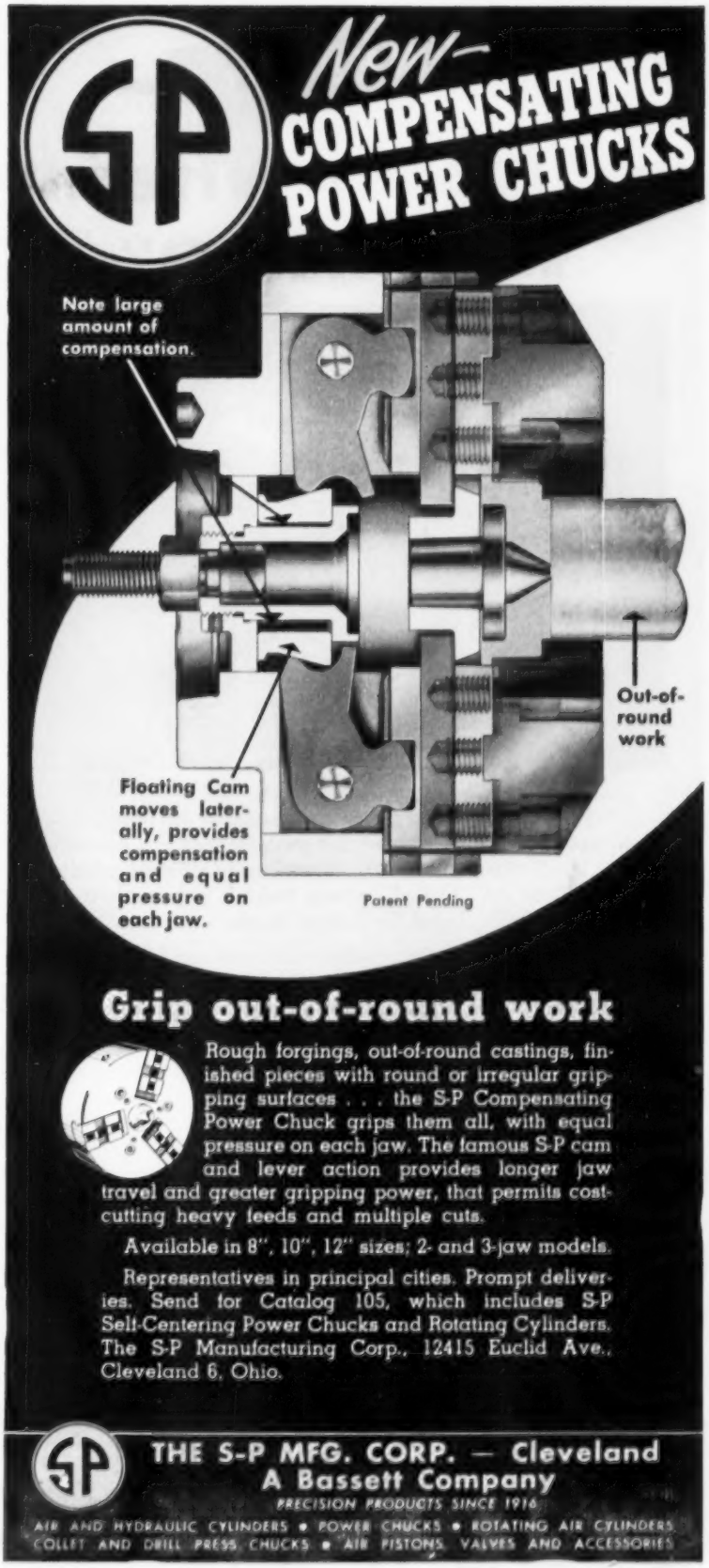
Miniature servo motor, Type 8-M, designed for use in controls systems, has the following characteristics: volts per phase, 26; free speed, 6700 rpm; speed at ½ stall torque, 3950 rpm; watts output, 0.293; current, 0.092 amp. Also available is generator, Type 8MG, with power input at 25 C of 1.8 watts, output at 1000 rpm of 0.3 v, and phase shift of 5°. Three models of transistor amplifiers for use with motor and generator are available.

Transicoil Corp, Worchester, Montgomery Cty, Penna

Drill bushing calculator is a pocket-sized plastic slide chart that provides proper drill bushing for a given drill size. Card carries selection data for all types and sizes of drill jig bushings up to 1¾-in. drill size. Chart is set for type bushing desired, then moved to correct drill size; factors obtainable are correct bushing OD, dimension from center to flat for clamp, and radius for lockscrew. Jig-design engineers can obtain chart free by requesting it on company letterhead.

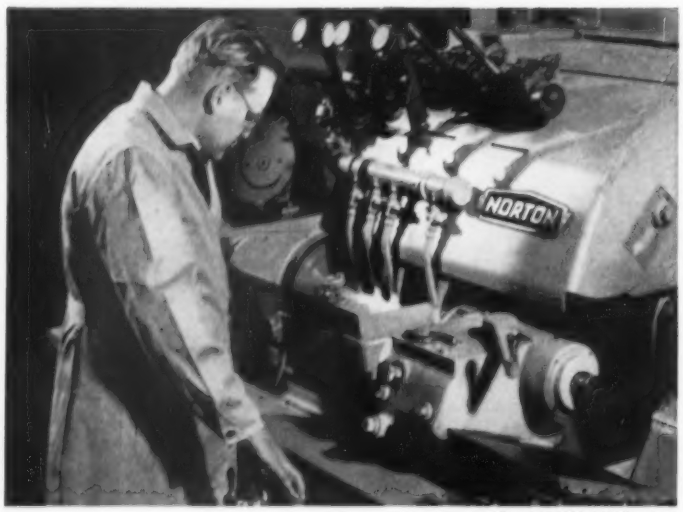
Universal Engineering Co, Dept G, Frankenmuth, Mich

Packaging material, a Mylar-laminated Grade A greaseproof product called Super Induwrap, for protection of metal parts, is said to have high strength and thermal stability qualities, will not ignite on exposure to flame or high temperatures, is creped to stretch for moldability. Available in heavy and medium


SP
New—
COMPENSATING
POWER CHUCKS
Note large amount of compensation.
Out-of-round work
Floating Cam moves laterally, provides compensation and equal pressure on each jaw.
Patent Pending
Grip out-of-round work
Rough forgings, out-of-round castings, finished pieces with round or irregular gripping surfaces . . . the S-P Compensating Power Chuck grips them all, with equal pressure on each jaw. The famous S-P cam and lever action provides longer jaw travel and greater gripping power, that permits cost-cutting heavy feeds and multiple cuts.
Available in 8", 10", 12" sizes; 2- and 3-jaw models.
Representatives in principal cities. Prompt deliveries. Send for Catalog 105, which includes S-P Self-Centering Power Chucks and Rotating Cylinders. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.
SP
THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916
AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

PRESTO!

an "Open Wheel" with "1500"



Courtesy of Norton Company

Grinding operations in a great many plants are impeded by slow settling of chips . . . clogged coolant lines . . . excessive foam . . . all of which result in costly loss of efficient grinding action. *Worse yet*, "loaded" wheels make it impossible to get clean stock removal and the desired finish.

Even the finest grinding machines are only partially efficient under conditions such as these. Seasoned operators know what is needed — a change to the proper coolant!

Shop superintendents will tell you the answer: Use *W & B Concentrate* **"1500"** Results are astounding and immediate. **Chips settle immediately; coolant lines run free; foaming stops as if by magic. Wheels are "open" and the result is keener grinding action and cleaner stock removal.** Case histories* of many such "1500" successes are at hand in the W & B files.

To know more about the advantages of using "1500", write for W & B Catalog Page A-3; or call in the W & B Industrial Lubricants Expert. Take advantage of W & B's 67 years of experience and know-how!

(*Names on request.)

W·B INDUSTRIAL LUBRICANTS

THE WHITE-BAGLEY CO.

WORCESTER, MASS. • DETROIT, MICH.

Originators of Grinding Lubricants

grades in 36-in. rolls or sheets cut to requirements.

Angier Corp, Framingham, Mass

Induction heating equipment in Allis-Chalmers line has been expanded to include low-frequency motor-generator units of 960, 3000, and 10,000 cycles. Available in sizes of from 30 to 1250 kw, units are reported particularly suited to brazing, case-hardening, and through-heating for forging and melting applications. Units augment company's line of high-frequency induction heaters.

Allis-Chalmers Mfg Co, Milwaukee 1

Gasket cutter, Hargrave No. 414, has lightweight phenolic body with steel blades, as well as inch and metric scales for accuracy. Tool cuts round gaskets ¼ to 6 in., odd shapes and straight pieces any size. Another cutter, No. 415, has an aluminum body with steel blades; extension arms on this model increase diameter to any size.

Cincinnati Tool Co, Cincinnati 12, Ohio

Involutes and spirals for facsimile machines are produced by optical generation technique, which employs photography to generate the master on ground glass plate 1/16, ⅛, or 3/16 in. thick. Tolerances are said to be held to 0.0001 in. Exact reproductions of original involutes and spirals can be mass-produced in any quantity.

Precision Photomechanical Corp, 170-3 S Van Brunt St, Englewood, NJ

Free Literature

To order any of these bulletins, please use cards at start of this section—page 184c.

MACHINES AND ATTACHMENTS

34 AUTOMATIC ASSEMBLY MACHINE — *Multra Corp, Stamford, Conn.* 12-page illustrated brochure describes 7000-lb unit with interchangeable assembly tools. Construction, operational, and mechanical features detailed; feed-back system, electrical controls, specifications covered.

35 DISK SANDERS AND GRINDERS —*Max Manufacturing Co, San Jose, Calif.* Brochure covers enlarged line; sizes range from 16 to 36 in., with single and double disk models in each size. Also covers abrasive cutoff machine, belt grinder, and saw sharpeners.

36 PUNCHES, SHEARS — *Whitney Metal Tool Co, Rockford, Ill.* 48-page general catalog covers additions to

PLUS values in power

the SMOOTH STREAMLINED CONTOURS

of HOWELL series one hundred motors . . .

LOOK BETTER ON YOUR MACHINES,

HAVE NO DUST CATCHING FINS OR OFFSETS

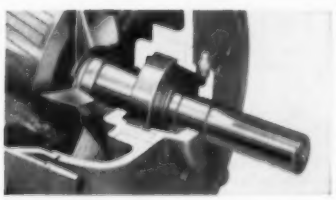
Designed for the Age of Automation, these sleek, new Howell Series 100 Motors add a plus value in modern good looks to your machines and equipment. Their streamlined contours are functional, too — no fins, ribs or unnecessary offsets on frames or end plates to collect dust deposits. Results: a motor that never loses its cool-running efficiency, good appearance that's easy to maintain, and a minimum of fire hazard from dust accumulations.

When you are selecting power units for your machines, why not consider superior good looks — they cost no more! Specify Howell Series 100 to get this and all the other plus values of today's most modern industrial motors.

GET THE PLUS values THAT COUNT.. specify HOWELL series 100 motors

heat-source ventilation licks tough applications

Wide stator slots provide 50% more contact between fan-driven air and stator laminations, main source of motor heat. To get an extra cool running motor, specify Series 100!



bearing protection doubled for longer motor life

On Series 100 TEFC motors, bearing cartridges seal out dust and dirt, even when motor is disassembled for servicing. You can't buy better assurance of motor dependability.

steel frames and feet— greater strength, less weight

Unlike cast iron, Howell's steel frames and feet won't crack under the stress of accidental mishandling or the excessive tightening of mounting bolts. Another plus value that counts.

For more details on Series 100 motors, write for Bulletin N-100-R

HOWELL Red Band MOTORS

HOWELL MOTORS

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

NOW YOU CAN REALLY

PUT THROW-AWAY INSERT ECONOMY AND EFFICIENCY TO WORK

VALENITE

insert tooling offers you—

- **MORE STYLES—the most complete line of holders and inserts . . . in stock.**
- **ADAPTABILITY—you can combine a large variety of standard elements to make up specialized tooling to fit your requirements exactly.**
- **VARIABLE INSERT THICKNESS—Four grades, four styles, each available in three thicknesses. Fit any holder, any assignment.**
- **NEW complete, Holder and Insert Catalog — biggest book ever devoted to throw-away holders and inserts.**

Write for Catalog—A-5.

VALENITE
METALS CORPORATION
Box 205 • Royal Oak, Mich.

Free Literature

line of punches, shears, presses, brakes, power presses and shears, small tools. Specifications of machines, details on punches and dies, descriptions of hand tools and special tools, current net prices included.

37 PLATEN PRESSES — *Rodgers Hydraulic, Inc, Minneapolis 16, Minn.* 4-page brochure 330 gives illustrated descriptions of applications for metal drawing, forming, plastic and ceramic molding. Covers hydraulic units from 50 to 400-ton capacities.

38 STANDARD INDEXING MACHINE CHASSIS—*Swanson Tool & Machine Products, Erie, Penna.* 6-page illustrated folder contains information on units available in 200 standard models for use as basic chassis for wide range of special automatic machines.

39 WHEEL FORMING ATTACHMENT —*Pratt & Whitney Co, West Hartford 1, Conn.* 4-page circular 596 illustrates and describes Diaform universal Model No. 10 for cylindrical grinders. Applications and specifications included.

40 AUTOMATIC PRESS ROOM EQUIPMENT—*F J Littell Machine Co, Chicago 13, Ill.* 28-page "Pre-View" catalog gives illustrated descriptions of contents of 24 new bulletins, available individually or bound together. Covers feeding equipment for punch presses, reels and straightening machines for coil stock.

TOOLS AND ACCESSORIES

41 GRINDING WHEELS — *Bay State Abrasive Products Co, Westboro, Mass.* 8-page booklet illustrates and describes electronic formulation process employed in manufacture of wheels for greater accuracy in engineering, manufacturing, and duplicating orders.

42 COOLANT — *Vitene Manufacturing Co, Mount Vernon, NY.* Literature gives data on Vytron, a transparent chemical coolant containing no petroleum, mineral, or vegetable oils, completely soluble in water. Wide range of metals, including very hard metals can be cut by varying the strength of the product.

43 GRANITE SURFACE PLATES — *Lawley Granite Surface Plate Co, Wyoming, Penna.* 4-page folder describes advantages of Pennsylvania Black (Diabase) Granite over other types for surface plate use. Data on comparison, strength, and flexure tests included.

44 SUBLAND TOOLS—*Mohawk Tools, Inc, Montpelier, Ohio.* 28-page catalog describes types, uses, and advantages. Applications discussed, standard and special tools covered.

45 AIR-OPERATED AUTOMATION PACKAGE — *Renco-Toledo, Inc, Toledo 7, Ohio.* Illustrated specification sheet describes Renco-Aire unit with micro-action air-operated directional valve for converting hand-powered machine tools to fully or semi-automatic operation. Construction data, specifications included.

46 COUNTERS—*Production Instrument Co, Chicago 6, Ill.* 8-page catalog M200 presents illustrated information on stroke and revolution counters with count life ratings from one billion to three million. Covers special assemblies for built-in applications, as well as assortment of individual number wheels, reset gears, shafts, etc.

PLANT SERVICE EQUIPMENT

47 PORTABLE PLATING UNIT—*Bart-Messing Corp, Belleville, NJ.* Illustrated literature describes Sel-Rex Jet Plater with 10, 20, or 30-gal capacities for rack or barrel plating operations. Features and specifications included.

48 PLASTIC HOSE — *Hofmann Engineering Co, Chicago 22, Ill.* 4-page bulletin covers Type H-52 plastic hose for compressed air at working pressure up to 125 psi. Features, advantages, specifications, and sizes covered, as well as fittings data.

49 BENCHES — *Pollard Bros Mfg Co, Chicago, Ill.* Catalog 304 illustrates and describes three basic styles, each available in 14 top sizes and three heights.

● SHELVING — *Hallowell Division, Standard Pressed Steel Co, Box 875, Jenkintown, Penna.* Illustrated catalog contains information on planning installation and ordering shelving in 1000 combinations to fit any storage or supply-handling need. Basic units and accessories, capacity charts, variety of shelf spacings obtainable are covered. Request direct on company letterhead.

PARTS AND MATERIALS

50 BEARINGS, BUSHINGS, BARS — *Johnson Bronze Co, New Castle, Penna.* 116-page miniature catalog 56 covers electric motor, general purpose graphited bronze, and Ledaloyl self-aligning bearings; hexagon and universal bronze bars. Sections on alloy data, decimal equivalents, sleeve bearing design practice included.

51 INVESTMENT CASTINGS—*Haynes Stellite Co, Long Island City, NY.* 40-page illustrated booklet contains design data; typical physical, mechanical, chemical properties of 26 investment-casting alloys covered. Advantages, case histories described, facilities discussed.

52 STAINLESS STEEL — *Washington Steel Corp, Washington, Penna.* 16-page illustrated booklet describes physical properties and analysis, relative corrosion resistance, fabrication, application, and care of MicroRold Type 430 nickel-free stainless steel sheet.

53 ELECTRIC BRAKES AND CLUTCHES—*Warner Electric Brake & Clutch Co, Beloit, Wis.* 8-page bulletin WEB 6212 contains illustrated data on devices utilizing an electro-magnetic principle to control a wide variety of machine motions. Specifications detailed for primary electric brakes, clutches, and clutch-brakes; fractional-hp RF electric brakes; SF electric clutches and clutch couplings; and tegral-hp electric brakes and clutches

54 TEFLON PRODUCTS—*Continental-Diamond Fibre, Newark, Del.* 17-page illustrated catalog T-55 describes tapes, sheets, rods, tubes, gaskets, and fabricated specialties. Applications, comparative properties, grade descriptions, machining information supplied.

55 PILOT-OPERATED CONTROL VALVES—*Valvair Corp, Akron 11, Ohio.* 6-page bulletin SK356 contains illustrated description of single and double solenoid Speed King valves. Operation, applications, optional features included, as well as tabular data covering types of service, pressure ranges, condensed specifications and dimensions.

56 REFRACTORY MOLYBDENUM BORIDES—*Climax Molybdenum Co, New York 36, NY.* 6-page bulletin Cdb-8 describes applications; chemical, physical, and mechanical properties; preparation of compounds. Complete data given for 4 molybdenum borides and 7 multi-boride systems.

57 MECHANICAL SEALS — *Crane Packing Co, Morton Grove, Ill.* 8-page illustrated technical bulletin S-205-2 describes complete line of chemically inert seals for handling all types of acids, corrosives, solvents, and gases. Contruction, service, and application data, including typical installations and engineering details, provided.

(Continued on page 222)

a Natural when it comes to Passes

Typical Monarch Roll Turning Story

12¼ hrs.

vs

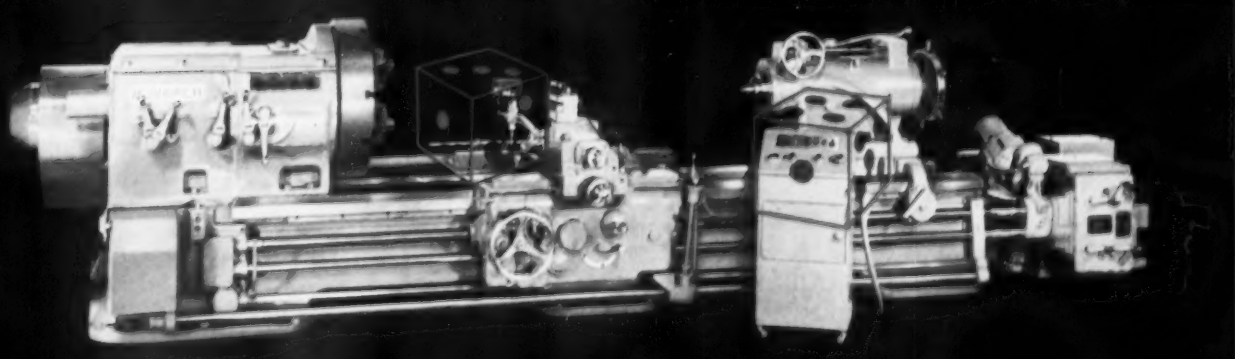
Old 31 hrs.

Why roll it the hard way when faster turning time is what comes naturally to our Heavy Duty Roll-Turner with Monarch-Keller controls? Every job report we ever got from a user confirms it! Consider this one:

Part is a 10" diameter roll having 30" body length and made of grain iron with a hardness of 60-65 scleroscope. It has 13 half-round passes ranging from 1⅝" to 1 $^{13}/_{16}$" diameter. Monarch rough turning time is 9¼ hrs.; finish turning time, 3 hours.—*total time, 12¼ hrs.*

For comparison, the most competent roll turner in the user's plant tried to compete on an old-style roll lathe. Working all-out, and much harder than the other operator, he still required 24 hrs. roughing time; 7 hrs. finishing time—*a total of 31 hrs.*

Why handicap yourself with costly old methods any longer? It's a sure bet that we can save time and money for you. Write for the complete story—illustrated Booklet #1302.



"SAVE IN MANY WAYS With The Monarch Heavy Duty Roll-Turner"

1. On all types of rolls which lend themselves to this method of turning, floor to floor turning time averages from ½ to ¼ of the former time.

2. With standard carbide turning tools with regular tool grinds, hundreds of form tools required by conventional methods are not needed. Tools can be changed with no sacrifice of contour accuracy.

3. With template controlled contour forming, matching rolls in pairs is unnecessary. Each roll turned from any given template is identical. One of pair of rolls can be redressed or new roll turned without matching the other.

4. When redressing a roll, the operator may quickly check the point of greatest wear with the corresponding point on the template after which he can be certain that the entire roll will clean up on the first pass.

5. The same template is used for both the rough and finish passes. Thus finishing immediately follows roughing with no set-up change other than the required tool change.

6. Operator cannot modify roll shape. As the template form is dimensionally the same as forms to be turned on the roll, their longitudinal placement and relationship are sure to be accurate.

Monarch

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

IN ADDITION TO ITS REGULAR LINE of precision gears, one of New England's oldest and ablest gear-engineering organizations is now fully equipped to produce fine pitch gears to your own specifications. Any size and quantity... any type of basic material, metallic or non-metallic. Complete heat-treating facilities.

Perkins has the equipment, the experience and the craftsmen to satisfy *all* of your custom-made gear requirements.

YOU FURNISH THE SPECIFICATIONS — WE'LL PRODUCE THE GEARS

PERKINS MAKES: bevel gears, ratchets, sprockets, ground thread worms, helical gears, spiral gears, spur gears-shaved or ground teeth, gear trains and assemblies, speed reducers.

✻ The **PERKINS PRECISION SPRING COILER** is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want when you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire sizes .005 to .125. Diameter, from 3/32" to 12" and larger. Size of the compact coiler is only 7 1/2x16". A POWER MODEL is available. Information on request.

PERKINS MACHINE & GEAR CO.
101 Circuit Avenue, WEST SPRINGFIELD, MASSACHUSETTS

Free Literautre

58 RESIN - COATED SAND FOR SHELL MOLDING—*Monsanto Chemical Co, Springfield, Mass.* 16-page booklet describes advantages of product. Discusses resins, sands, equipment, coating techniques, and production of blown shell molds and shell cores. Section on trouble-shooting shell mold and core production included.

59 CORROSION - RESISTANT PIPE MATERIALS—*American Agile Corp, Bedford, Ohio.* 12-page catalog illustrates and describes line of polyethylene and polyvinyl chloride pipe, tubing, ducting, valves, and fittings.

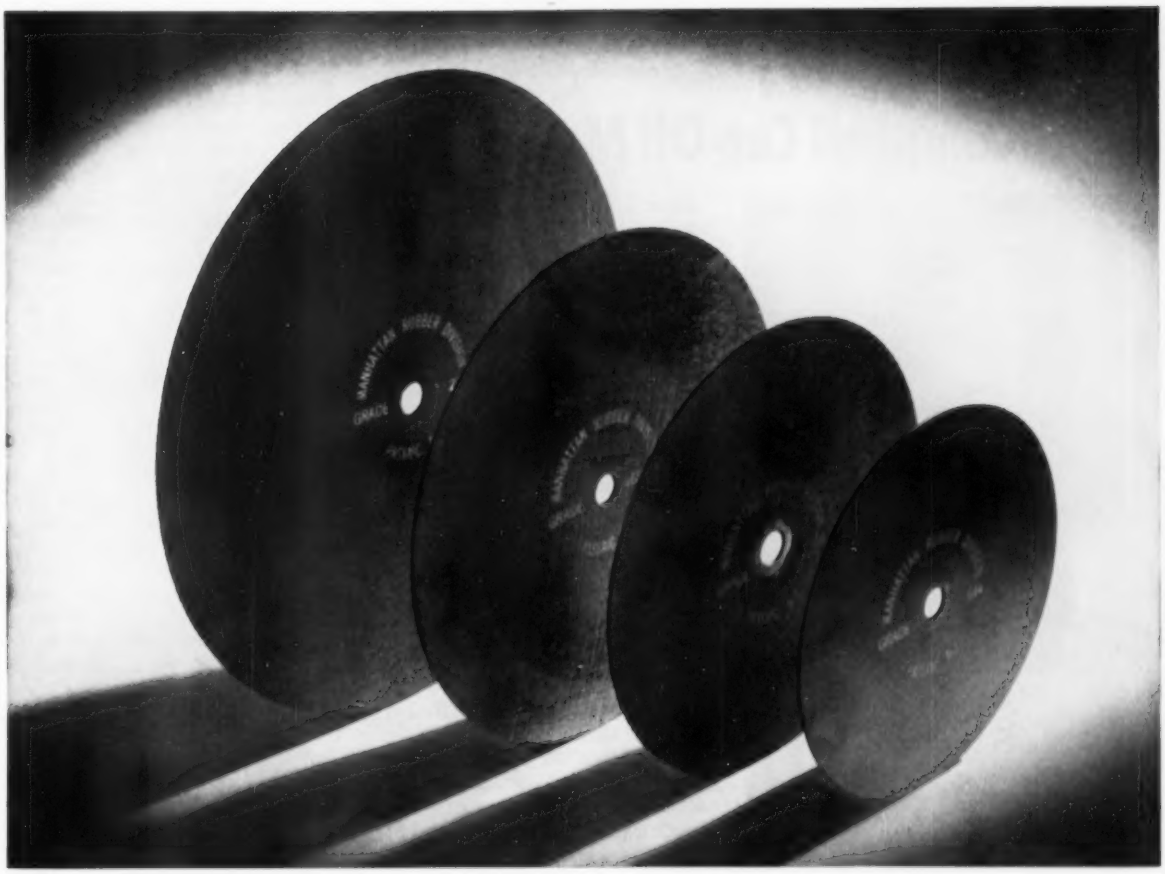
ROUND TABLE *Discussion*

EXECUTIVE FOREMAN

How "executive" should a foreman be? Where is the line drawn between availability and leadership? If a foreman makes himself available for questions, and worker-guidance, is he minimizing his responsibilities?

Ed has the right interpretation of the meaning of the term executive. The foreman is in the shop as the representative of management. He is there because the managers of the company do not have the time and, perhaps, the individual skills to personally supervise and run every department. The foreman is there to carry out management's orders and

"Men are such idiots!"



Cleaner Cutting . . . Longer Wheel Life with MANHATTAN CUT-OFF WHEELS

Safe, fast, clean cutting over sustained periods saves you both time and money. Manhattan Cut-Off Wheels give you cleaner cutting at higher speeds because every wheel is custom-bonded for your specific cut-off job . . . whether you work with hardened or soft steel, light gauge tubing or critical alloys. New Manhattan developments in both rubber and resinoid bonds account for this greater cutting efficiency . . . and longer life for the wheels. In factories where records are kept of the number of cuts per wheel, Manhattan wheels have proved they do a better job . . . and *last longer* than any other wheels.

Manhattan Cut-Off Wheels are custom-manufactured for your requirements in the widest range of types and sizes. Manhattan Abrasive Wheel engineers will assist you in specifying the exact construction to improve cut-off operations at your plant. They'll show you how you can save time and money . . . get "More Use per Dollar" . . . with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels.

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

Abrasive Cutting | *the best way to cut many materials the only way to cut some*

Campbell Cut-Off Machines

• Cutting 20-foot tubes of stainless steel into 1" to 17" lengths

Slice $32,000 a year from tube cutting costs

• Because CAMPBELL Abrasive Cut-Off Machines not only cut stainless steel tubes twice as fast as former methods—but the clean cut saves a deburring process—Ryan Aeronautical Company saved $32,000 the first year of its operation.

Ryan uses thousands of pieces of this stainless steel tubing each month in ball-and-socket joints, nipples and sleeves of exhaust systems. They must be precision-cut from 20-foot pipe in lengths from 1 to 17 inches.

The smooth-finish cut of the CAMPBELL Oscillating Wet Abrasive Cut-Off Machine is extremely accurate — with no hard spots, no change in metallurgical characteristics. It results from the WET cut with abundant coolant supplied just where it will do the most good. Speed and economy come from the OSCILLATION of the abrasive wheel . . . the right one for the job.

Some additional performance figures

Smooth cutting on CAMPBELL Oscillating Wet Abrasive Cut-Off Machine saves an extra grinding operation on gear tooth samples cut for metallurgical study.

International Nickel's tough K Monel, 4¾" dia., is cut in 2 minutes per cut on a CAMPBELL Oscillating Wet Abrasive Cut-Off Machine.

How to get expert advice on your cutting problems

• CAMPBELL Engineering Service costs you nothing—can save you much. Does your metal cutting problem involve cutting of alloy or high carbon steel? Our Field Engineers are abrasive cutting specialists. They can help you arrive at just the right combination of a CAMPBELL Cut-Off Machine and ALLISON Cutting Wheel that will improve your operation and save you money.

Let us send you this book

ACCO

TRADE MARK

Campbell Machine Division
AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Connecticut

to see that the department functions in its best interests.

He can best do this by having an observation post at the edge of the department which gives him an overall view of operations. This is a much better approach than getting right down into the work. The foreman who tries to get down into the work will be snowed under by a great volume of minor details; he will not be able to see the forest because the trees are in the way.

It has frequently been said that the good executive should possess a slight tendency toward laziness. This does not mean that he dislikes work, but simply that he has developed a desire to delegate as much work as possible to his subordinates. There are those who take a short-sighted, narrow viewpoint and attempt to do everything themselves. Perhaps they are only trying to demonstrate their ability, or what is more likely, they lack confidence and try to hide from the real work of their department by burying themselves in the details which are rightfully the sphere of their subordinates.

There is another reason why the foreman may follow along on every detail; he may not have confidence in the ability of his group leaders. If this is the case, he should make every effort to train the men who have good potential and to replace those who are not capable of learning their job. Training of subordinates is one of the most essential functions of every supervisory position. Training to permit the man to know and do his job well, and to advance himself to higher positions, is essential to the success of the company. Since aptitudes may remain dormant and undeveloped, a man may not even know that he possesses them. The alert supervisor is always

"Interesting case, that Burns—started at the bottom 18 years ago and hasn't moved!"

"...and then they put that hot bar of metal between the upper die and the lower die and.....WHAM!"

Look who's showing off! Well, he doesn't know everything—yet! But he sure has learned something about his old man's forging business from that color booklet in his back pocket.

It's called "Forgeland, U.S.A."—an interesting, instructive book about *your* business and *ours*, written in *his* language and with pictures, too! We've prepared it here at Erie, because we think it's nice for Pop to be a hero in his own home—and we're all for encouraging it.

To quote your beloved smart-aleck, "Aw c'mon Dad, get me the book will yuh, huh, please, huh, please—it's for FREE, anyhow . . . not even any box tops or hammerscale to send in!"

ERIE

ERIE FOUNDRY CO. ERIE, PA.

"OUR 61st YEAR"

FORGING HAMMERS • TRIMMING PRESSES • HYDRAULIC PRESSES AND ALLIED EQUIPMENT

let your Youngsters learn about FORGING

If you have a raft of kids—send for a raft of books:

ERIE FOUNDRY CO., ERIE, PA.

Send ____ "FORGELAND U.S.A." Books to:

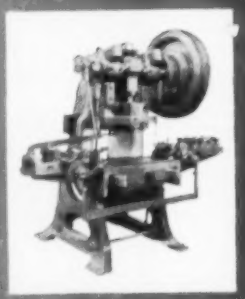
NAME _____

FIRM _____ TITLE _____

ADDRESS _____

CITY _____ STATE _____

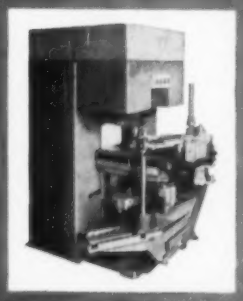
Which one is best?



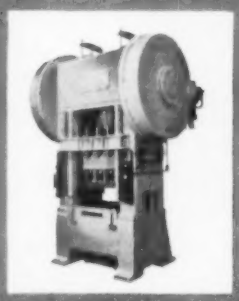
INCLINABLE . . .

Talk to the man

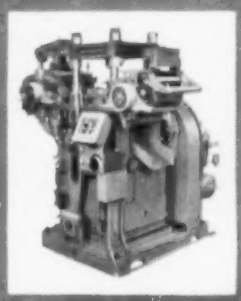
Presses and methods that automatically reduce costs



NOTCHING MACHINE . . .



STRAIGHT SIDE . . .



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Our representative is as near to you as your telephone. The names and addresses of the companies representing us are listed on the right. Don't miss calling in these experts on any press replacement or modernization program.

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REPORT No. 5098B-3

Multiple Screw Driver assembles 400 carburetors per hour

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This compact, easy-to-operate Multiple Screw Driver is just one more example of how AIR engineering is helping modern industry solve problems and cut production time and costs.

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8-Spindle Multiple Screw Driver for carburetor assembly.

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on the lookout for undeveloped talent.

I am all in favor of Ed's approach to the foreman's job. Leave the details to the lead men and concentrate on the real work, the important work of guidance, leadership, and training.

Clifford Molloy
Bronx, NY

If my interpretation of a foreman is correct he is one who is given executive power over others in his department. His ratings may go from straw boss—because of his willingness to shoulder many details, thereby relieving the regular foreman of petty annoyances—to that of a shop dictator who is inclined to look down his nose at those under him.

Not all foremen are of executive caliber; in order to be such they must have the power, knowledge, and ability to direct. Some execs have the power but do not possess the amount of knowledge necessary to direct, whereas others may attempt to direct regardless of its effectiveness, thereby resulting in half-cocked supervision and general confusion. Some of these hybrid foremen become little gods in their own minds and expect many knees to quiver whenever orders are handed out. If the truth were known this freak of industry becomes the laughing-stock of the crew and fails completely in the important task of getting the cooperation so necessary to keep down expenses.

I had the "pleasure" of seeing one of these phonies take over in a well run machine shop many years back and within three months confusion was so rampant, and the turnover

"That's our electronic brain—it's almost human!"

was so high, that it was only through his replacement that the firm was saved from going on the rocks. Thanks to manufacturing efficiency of the present we are saved from such things although there are times when a pretty smooth four-flusher will worm his way into power for a short duration. If anyone has had the experience of working under one of these industrial high-jackers he will know that the relationship between the boss and his men is anything but harmonious. Usually one will find that such an ill-placed "executive" is devoid of sufficient experience to direct his men properly and, in order to carry on without serious detection, passes the buck along to the more enduring shoulders—no doubt some poor misguided sucker earning half his salary.

Let us take a foreman of the other extreme, who sweats it out doing his own work and does what he can to help out by attending to myriad details. I wouldn't call him an executive foreman by any means, as he fails to get the whole vision of what is required in his department. He's inclined to jump in and run a lathe in order to get a job out in time, thinking he is accomplishing some good. While he is doing this he fails to see what others shouldn't be doing. He has the wherewith to make a good executive—experience, knowledge, and cooperativeness—but he fails in one harmful way: he's too damned big-hearted; he undertakes too much of his own accord.

Here we have two men supposedly with the same duties to perform. One passes the buck to others, letting them stew over details, while the other worries and sweats over many details to which he really hasn't time to attend. Assuming the exec has the proper qualifications, let us not

"Now how did this confounded automatic machine know that I had a cold?"

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POSITIVE TORQUE CONTROL—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.

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NO CLUTCH—to wear, slip or require adjustments.

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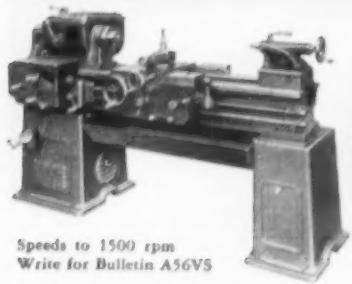

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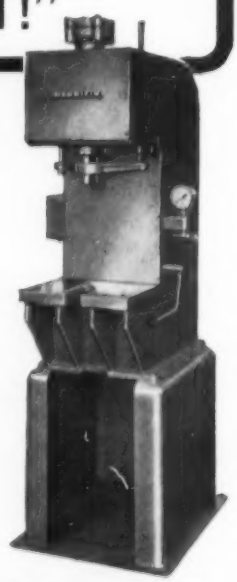

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over-burden him with details he can turn over to others. Maintain an effective executive demeanor by being observant to as much of what is going on as is physically possible so that you can jump into the breach with suggestive advice. Don't be too soft with your men and take upon yourself the details they themselves should assume. Make it known to them that you can't be bothered with unnecessary problems which should be handled by the workers themselves. Hold yourself open at all times to render important decisions regarding the work at hand. The boys will soon realize that your time is too valuable to squander on petty matters and they will soon realize that it is up to them to put forth more effort to do their own thinking.

Jack Everett
San Francisco, Calif

I think it may be assumed that both Al and Ed are foremen of comparatively large groups, interspersed with lead men (group leaders), and that the question is the advisability of going all out (or not) in delegating details to these leaders.

Circumstances naturally alter cases. In the brief write-up, several angles are not mentioned and only general assumptions can be made.

Reading between the lines, I would say that Ed is plenty big enough for his job, while the job is plenty too big for Al.

The old adage about not acquiring ulcers when you push your business but getting 'em when the business pushes you, is very applicable also to foremanship, and supervision in general. Ed has the right idea, but, of necessity, there must be limits.

By limits I mean personal contact

"OH, NO! Looks like I put the automation tape on the tape recorder by mistake."

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NEW OAKITE CLEANERS
GIVE YOU MORE FOR YOUR
PAINT-PREPARATION DOLLAR

Here are 4 ways to end pre-paint metal-cleaning troubles

Does your trouble chart show that you need better cleaners, strippers or surface conditioners?

- ☐ Cleaning solution foams excessively in spray washing machine. See 1 below.
- ☐ Streaky discolorations or powdery residues cling to surface of steel parts being stripped for repainting. See 2.
- ☐ Zinc phosphating process too difficult to control . . . Iron phosphating process doesn't show good results in salt spray tests. See 3.
- ☐ Too many operations—cleaning, pickling, neutralizing, etc.—are needed to prepare steel that does not require phosphating before painting. See 4.

Here are brief descriptions of new Oakite materials designed to end these particular troubles:

1 For a spray washing solution that does not foam at high pressure, try Oakite Composition No. 161. Does not attack aluminum.

2 For stripping pigmented paint, phosphate coatings and undercoat rust *in one operation*, try Oakite Rustripper.

3 For a zinc phosphating process that is truly easy to control, try new Oakite CrysCoat SW . . . For salt spray results far beyond the capacity of ordinary phosphating processes, try new Oakite CrysCoat No. 89.

4 For *one-operation* removal of rust, heat scale, welding residues and light soil together with good preparation for painting, try Oakite Compound No. 131. Inhibited against attack on steel.

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with the workers and availability for them to take up their personal problems with you. Personal relationships cannot be shunted, but by far the greater part of the production, construction and maintenance problems may and should be delegated to competent lead men, and to this end the knowing foreman or supervisor selects men on whom he feels he can rely.

At an SAM meeting recently, the speaker gave eight requirements for a successful boss and listed them in order of importance as follows: managerial skill, fairness, intelligence, common sense, understanding attitude, energy, humor, and patience.

He also said that the successful and adequate supervisor was one who could give those under him a one-way ticket to hell and make them look forward with pleasurable anticipation to the trip.

The very happy faculty, or ability, to use the other fellow's brain and brawn and make him like it is a God-given trait and one sadly lacking in too many supervisors.

There is an old book, written way back when—"The Water Babies," by Charles Kingsley, that is worth anybody's reading (provided one is not too old to enjoy a fairy story!)

It carries little Tom through various stages of development wherein he meets Mrs Bedonebyasyoudid and Mrs Doasyouwouldbedoneby. Finally Tom starts on a pilgrimage to find Mother Carey, who re-makes all things. In time he reaches her but instead of finding her cutting, snipping, hammering, machining, shouting orders and running wildly around, she is seated quietly, the picture of calmness and serenity, and with plenty of time to talk to Tom. She had found the way to make things re-make themselves.

I think Ed has some such idea perking, probably subconsciously,

"It's an ill wind that doesn't blow some good. Think of what a wonderful safety slogan someone will think up because of this!"

and in handling his men is attempting to make them self-sufficient, for delegation of details works both ways.

Quote: "But the term 'handling men' is to a large extent a misnomer. By and large, the men handle themselves—the young executive's job is to get them to handle themselves in a manner that will result as a credit for him, and as a profit for his company." (SOUTHERN POWER AND INDUSTRY, (Feb, '56.)

I once had a boss who was really top-flight. He said one day, "Play it smart. Don't call attention to yourself any more than you can help. Eng'neer the deal, let the other fellow do it, and you see that he gets as much credit as possible. It won't be too long before the top brass finds out that you are an executive and will kick you upstairs without your having to sweat it out the hard way."

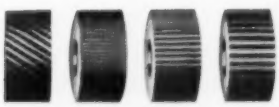
You need not be guilty of passing the buck when you delegate chores and details to competent lead men. You may fool the boss, but it will take the men only a very short time to pass judgment as to whether or not you know your job. When they feel that it's no bluff you are running and that it's not their shoulders but their capabilities and willingness that you are depending on, they'll gladly take as many responsibilities as you see fit to give them.

I don't read into the context that Ed means to make himself unavailable in an aloof sort of way. It's the shop details and run-o'mine problems he wants to pass on. If he is smart enough to realize how he can save himself many detail headaches, he is also smart enough to realize that the value of personalized human relationships is the cornerstone on which his policy is based and he will bend over backwards to help with personal problems. He is also smart enough to protect his workers and assume the blame himself if something goes haywire.

Robert U Garrett
Asheville, NC

REAMERS

TAPS



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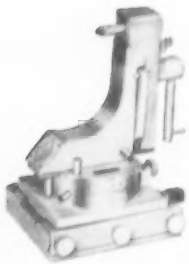

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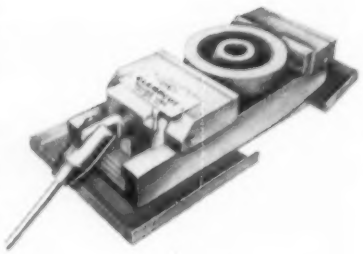

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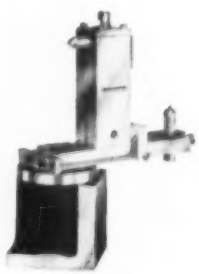

J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12" convex, up to 15" concave. Prices start at $45.00.

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New Books . . .

ELECTRODEPOSITION OF TITANIUM (PB 111798)—*By A W Schlecten, M E Straumanis, and C B Gill, Missouri School of Mines and Metallurgy, for Wright Air Development Center, U S Air Force. Published by Office of Technical Services, U S Dept of Commerce, Washington 25, D C. 57 pages. Price $1.50.*

An Air Force research project, this book describes a relatively simple procedure for obtaining a diffusion coating of titanium on iron, mild steel, copper, and other metals. The coating is very high in titanium content and displays good corrosion resistance. Many of the variables in the process are described. Data are also presented on the corrosion on titanium in fused salts, the resulting products, and the probable mechanism.

•

FATIGUE PROPERTIES OF TUNGSTEN-ARC BUTT-WELDED WROUGHT ALUMINUM ALLOYS *(PB-111616)—By True T Oberg and Edward J Ward, Wright Air Development Center. Published by Office of Technical Service, U S Dept of Commerce, Washington 25, D C. 27 pages. Price 75¢.*

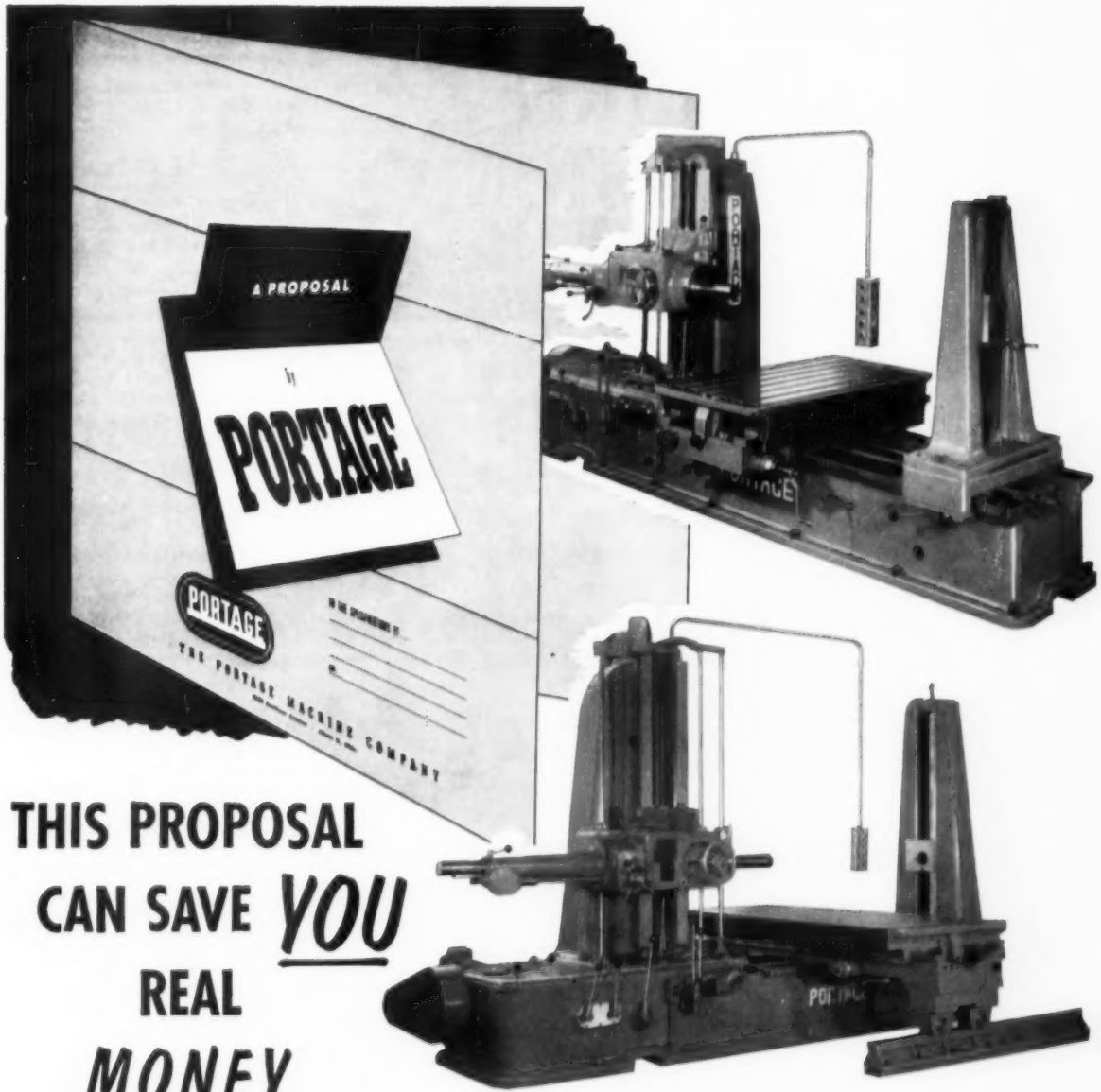
A study is made of fatigue characteristics in reversed bending of argon-gas-shielded tungsten-arc butt-welded joints in 14S-T and 75S-T sheet alloys. The process does not appear to produce joints of satisfactory fatigue strength in these alloys. This appears to be a result of the alloy properties, as the process is used satisfactorily on other materials. The static tensile strengths of the welded joints varied from 46 to 69% of the tensile strengths of the metals tested.

•

THE TOOL AND DIE INDUSTRY — *By Andrew E Rylander. Published by Bellman Publishing Co, PO Box 172, Cambridge 38, Mass. 26 pages 6 x 9 in. Paper cover. Price $1.*

One of a series of monographs in the vocational and professional field, this booklet is designed for guidance activities and to aid young men in the choice of a career. Starting with a brief history of tools and toolmaking, it defines the various types of tools and dies and enumerates the training and qualifications needed to

To



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undertake work in this field. It points out the advantages, remuneration, and opportunities for advancement, and stresses the importance of tool and die making in American economy.

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1956 COLLECTED TECHNICAL PAPERS, ASTE—*51 lectures and a panel discussion from the Chicago annual convention in March, plus two ASTE Research Fund reports, and a preliminary summary of ASTE Automation Survey. Published by American Society of Tool Engineers, 10700 Puritan, Detroit 38, Mich. Library edition, leatherette binding. 524 pages. $4 to members, $7.50 to non-members.*

Coverage includes a diversity of discussions on such subjects as ceramic tooling, silent-sound and electrical-discharge machining, automation, electronic calculators, laboratory research in conjunction with production machining and the training and development of tool engineers.

Included among the lectures is a Shaped Diamond-Tool Symposium, co-sponsored by ASTE and Armour Research Foundation, embracing eleven papers presented by authorities in the diamond industry.

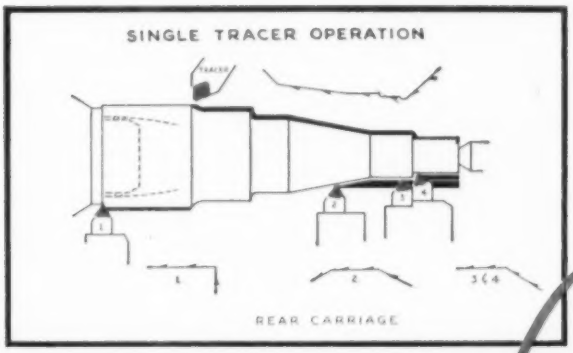
•

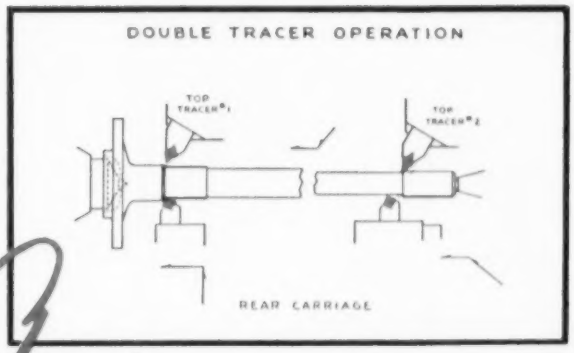
UNTERSUCHUNG ZUR ANWENDUNG DER DAUERMAGNETE IN DER TECHNIK (INVESTIGATION OF THE APPLICABILITY OF PERMANENT MAGNETS IN INDUSTRY)—*Dipl Ing H Spodig. Published by Westdeutscher Verlag, Ophovener Strasse 1 - 3, Opladen, Germany. 44 pages, 3¼ x 11⅝. Paper cover. Price DM 9.80.*

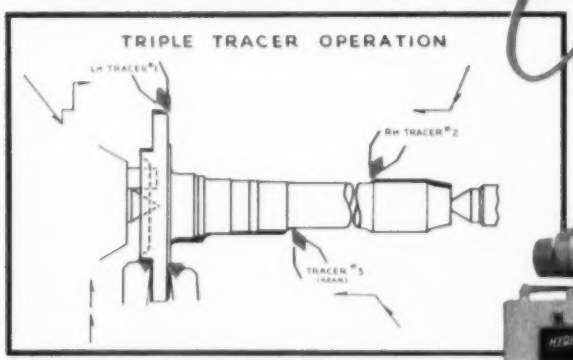
This is research report No 212 of the Wirtschafts- und Verkehrsministerium Nordrhein-Westfalen for 1955 and deals with the ever-increasing use of permanent magnets. Chiefly responsible for this increase has been the development of modern alloys which have made possible a notable decrease in weight for a given energy output.

The purpose of the research was to study the possibilities of the use of permanent magnets in metalworking and to give the designer a broad basis for the construction of magnets for existing applications.

Some of the examples deal with the separation of dry magnetic from nonmagnetic particles by means of rotary drums and by axial methods between face plates, and of removing magnetic particles from liquids, such







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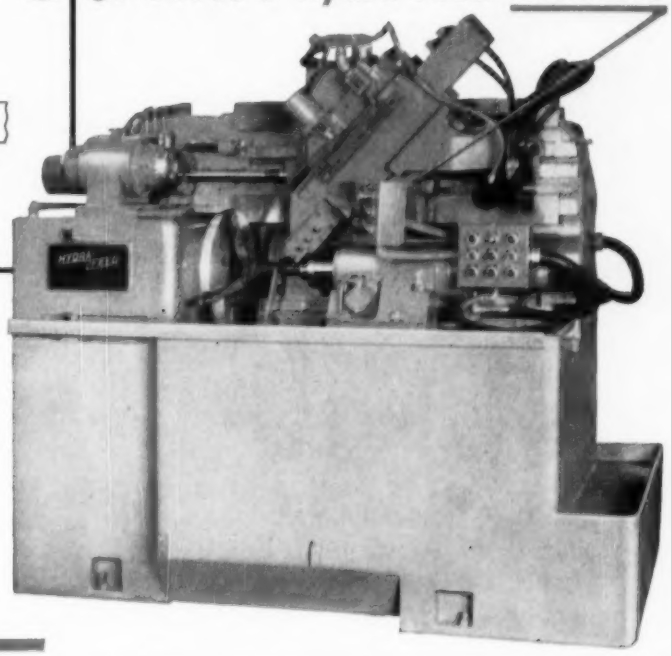

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Rough and finish turn such parts as axle shafts, camshafts, stem pinions, etc., in one setup using the right combination of tracer and rear carriage tooling. Roughing is done with rear carriage tools and finishing with one, two or three tracers—either right or left hand. Three standard models, HDT-8, HDT-12 and HDT-16, enable you to get the best machine for the job.

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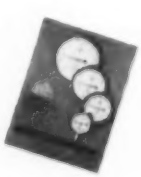

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as grinding, honing, and lapping fluids, or the lubrication systems of large internal-combustion engines.

It also describes a very successful installation for handling hot-rolled steel bars at temperatures of 900 to 1100 F, where trouble was formerly encountered with burning of the insulation on electromagnetic devices. The book closes with a complete listing of the several hundred other research reports of this institution covering a wide range of subjects.

Reviewed by E H Delling

•

MACHINE DESIGN—*By Joseph Edward Shigley, professor of Machine Design, Clemson College. Published by McGraw-Hill Book Co, Inc, 330 W 42 St, New York 36, N Y. 500 pages, 6¼ x 9¼ in. Price $7.75.*

An ideal book for the serious student of machinery design, it is written in clear concise language and profusely illustrated with pictures, charts, diagrams and tables. Problems presented are fine exercises in creating the ability of the student to think for himself.

The practical man as well as the student will find this book valuable as a handy reference because of many formulas and other information found on such subjects as stress and deflection of machine parts, gears, springs, clutches, brakes, antifriction bearings, flexible machine elements and principles of machine design.

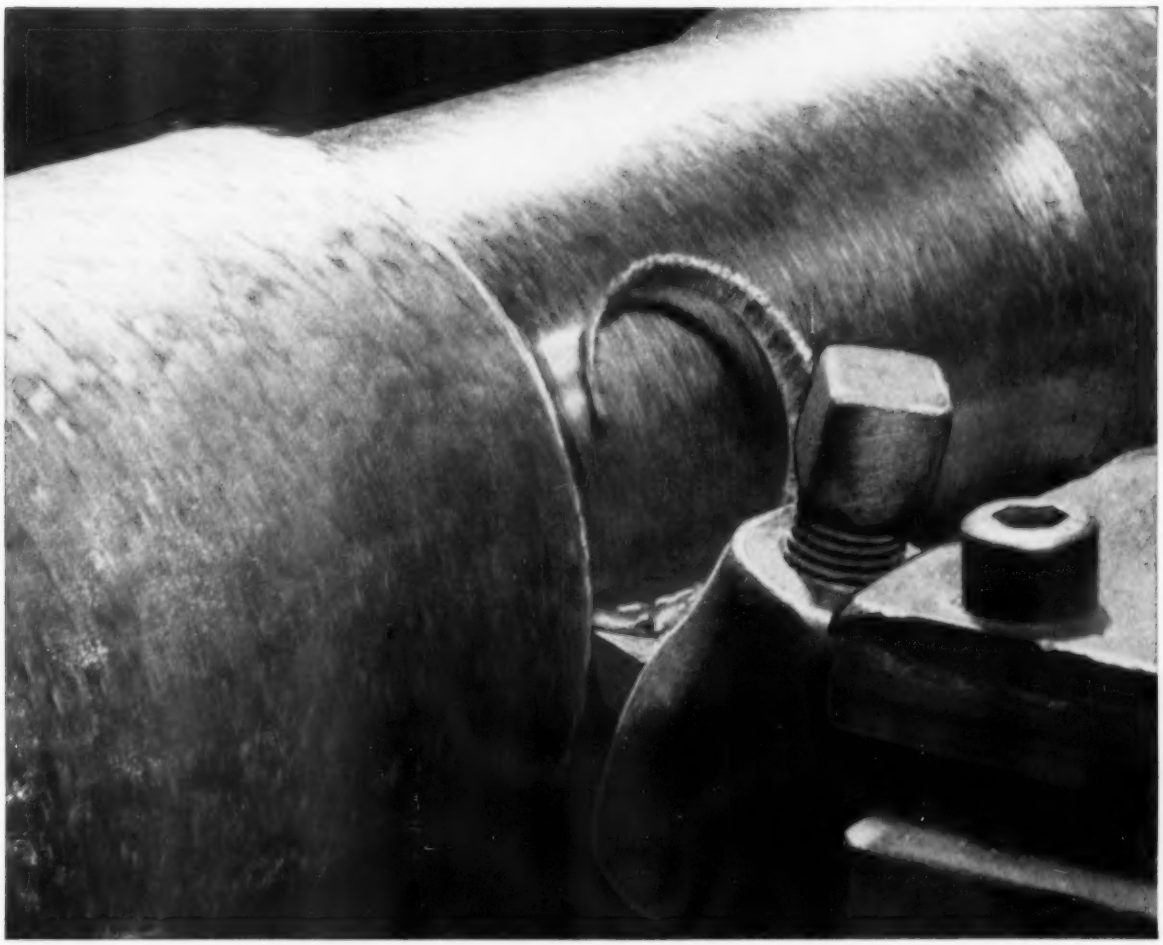
All subjects are equally well covered; it is impossible to say that any one part of this book is better than the rest.

•

RESISTANCE OF MATERIALS (4TH EDITION)—*By Fred B Seely, professor of Theoretical and Applied Mechanics, emeritus; and James O Smith, professor of Theoretical and Applied Mechanics, University of Illinois. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16. 454 pages. Price $6.50.*

Materials can react in two ways to loads—elastically and inelastically. This fourth edition has gone through considerable revision so all major phases of strengths of materials can be considered both ways.

The text covers the relationships between loads, stresses, and defor-



One Pound of Metal Removed Per Minute

Two HAYNES STELLITE alloy tools remove 118 cubic inches of metal from rough, uneven nickel-chromium billets in 20 minutes. They trim ½ in. from the diameter in one pass, and finish two of the 170-lb. billets per grind. Each tool removes about a pound of metal per minute in spite of the irregularity of the billet. Cutting speed is 37 surface ft. per minute and the rate of feed is ⅝ in. per minute. Heat generated during the cutting operation quickly dulled the cutting edges of high-speed steel tools tried on this job, and the rough cut caused other tool materials to chip. Only HAYNES STELLITE 98M2 cobalt-base alloy tools proved to be both hard and tough enough to do the job efficiently.

HAYNES STELLITE alloy tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they take deep cuts.

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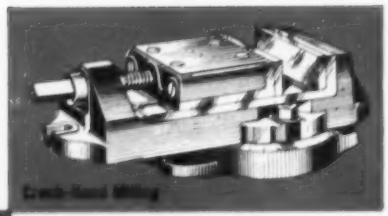

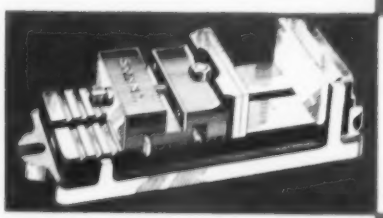

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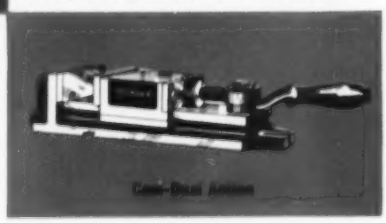

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mations; twisting, bending, combined loads, buckling, fractures, and many other standard strength-of-materials subjects. There is a second section of the book that takes up special categories that do not fit into the standard strength-of-materials course of study; including reinforced beams, unsymmetrical bending, two different mathematical methods for figuring beam deflection, and others.

The book is well printed and bound, and includes a good number of illustrations and many problems. It appears well organized, and is written in such a way that it can be used for reference—that is, any section may be read with a reasonable degree of clarity if the reader is only trying to clear up a single point in his mind.

One problem with many textbooks is that they are much removed from reality. This is not the case with Resistance of Materials; the explanation of a factor of safety illustrates this by its sensibility.

•

DISABILITY RETIREMENT IN INDUSTRIAL PENSIONS PLANS—*By W Michael Blumenthal. Published by Industrial Relations Section, Dept of Economics and Sociology, Princeton University, Princeton, N J. 63 pages, 6 x 9¼ in. Paper cover. Price $2.*

A carefully detailed study of the problem of dealing with the worker who is obliged to retire before the normal retirement age by reason of mental or physical total disability. It examines the provisions, practices, and problems concerning early retirement in 127 leading companies as a means of helping management to appraise and reassess the general approach to the problem and to correct existing weaknesses, and offers suggestions for future developments in company planning.

•

PLANT OPERATORS' MANUAL — *By Steve Elonka. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, N Y. 292 pages, 6 x 9. Price $5.*

With over 1500 illustrations, this completely practical book is designed to show steam engineers, and plant mechanics how to maintain and operate their equipment, giving methods and pointers to help in daily work, as well as to assist in future upgrading and license examinations. One of the most valuable features is

the sequence illustrations showing each operation step-by-step in photographs and line drawings.

Boilers, steam engines, turbines, diesel engines, pumps, compressors, and similar equipment are covered, and practical details are given for such jobs as setting steam-engine valves, charging a Freon compressor, overhauling a bearing, and timing and setting diesel valves. Included also is information on the latest instruments in the power field, such as the alignment telescope for aligning bearings of large turbo-generator units.

•

DAMPING, ELASTICITY, AND FATIGUE PROPERTIES OF UNNOTCHED AND NOTCHED N-155 AT ROOM AND ELEVATED TEMPERATURES. (PB 111618)—*By L J Demer and B J Lazan, University of Minnesota, for Wright Air Development Center. Published by Office of Technical Services, U S Dept of Commerce, Washington 25 D C. 77 pages. Price $2.*

Data are presented on the damping, elasticity, and fatigue properties of N-155 under rotating bending stresses. Specimens were studied at room temperature, 1350 F, and 1500 F, and results are compared on two bases; equal stress, and equal stress ratio. The approximate fatigue values for unnotched specimens at these three temperature levels, 53.0, 40.0, and 29.0 ksi, were found to be in good agreement with earlier research. The notched fatigue strength values obtained indicate a decreasing fatigue-strength reduction factor or effective stress-concentration factor, as the temperature is raised.

•

ELECTRODEPOSITION OF TITANIUM (PB 111876)—*By W E Reid, Jr, C A Gaudette, and A Brenner, National Bureau of Standards, for Wright Air Development Center, U S Air Force. Published by Office of Technical Services, U S Dept of Commerce, Washington 25, D C. 11 pages. Price 50¢.*

A study of alloy baths for plating titanium. The preparation of concentrated titanium-aluminum and zirconium-aluminum alloy baths by other means than use of the difficult-to-obtain borohydrides of titanium and zirconium was investigated. This was done by reacting in an

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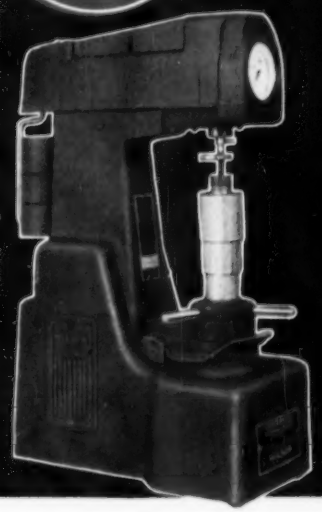

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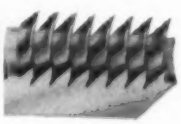
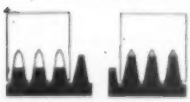


Truncated Thread Form



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ether solution, boron trichloride, lithium aluminum hydride, aluminum chloride, and titanium or zirconium tetrachloride. The method was not successful. An investigation was made of the possibility of using alcohols as complexing agents in solutions of titanium halides, but no metallic deposits were obtained. The unavailability of lithium borohydride made necessary an examination of methods for preparing this compound, and a quantity was prepared.

•

TECHNICAL DIGESTS—*Published by the Organization for European Economic Cooperation, 2000 P Street, N W, Washington 6, D C. About 150 pages, 8¼ x 10¾ in. Price $2.50. Published monthly at $24 per year.*

Already established in Europe, this Digest is now being made available to American industry. Over 1000 European periodicals are surveyed regularly, and technical articles likely to be effective in increasing productivity are selected from them. The articles selected are those describing processes, methods, materials, or equipment which can be applied fairly quickly and easily in industry.

Digests are highly informative and somewhat more detailed than mere abstracts because language considerations require that they serve as substitutes for the original articles. They are arranged according to general subject and cover ceramics, glass, chemicals, protective coatings, electrical engineering, food products, leather, materials handling, metallurgy, metalworking, machine-shop techniques, transport, packaging, safety, public health, structural engineering, textiles, and wood. The table of contents includes a one-line annotation under each title for rapid selection.

A particular advantage of most of the information given lies in its having been tried out in Europe in commercial plants, reducing the risk of an untried product.

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Part I, "Data Processing and the Computer," is designed particularly for office personnel and shop supervisors, foremen, and workers. It explains the evolution of computers in terms of data-processing functions and standard business methods; illustrates the division of data processing into five basic functions, and the earlier mechanization of the processs by punched-card and tabulating equipment; and shows the computer at work as a completely self-contained system.

A non-technical basic explanation of what the computer is and how it works is provided in Part II, "The Computer System." It is intended for office personnel and financial and middle management who will be involved directly or indirectly with the computer. It describes the language of the machine, explains binary arithmetic and shows how information is fed to the computer and how it is processed, stored, and returned.

For the general orientation of financial and middle management and top management, Part III, "The Feasibility Study," tells how to go about finding the right electronic data processing system for the job, what a feasibility study consists of, and at what point in the study a decision on computer installation may be made. It shows how to select one major area of data processing for analysis; how to study existing methods; how to compare available equipment in terms of speed, capacity, and cost; and how to plan a trial system.

Part IV, "The Electronic Frontier in Business," emphasizes applications, both current and long-range. It presents electronic systems at work on such pay-out applications as payroll, material, and inventory control and illustrates the frontier uses that represent the significant long-range contributions of the computer; for example, operations

research. It then considers the personnel aspects of conversion to electronic data processing, including retaining of clerical workers. This strip is designed for top management and financial and middle management to help them understand what computers can do and how they affect over-all company planning and policy.

•

ZINC CONTROLS CORROSION — *Produced by the American Zinc Institute Inc, 60 E 42 St, New York 17, NY. 16 mm, sound, color. Running time 35 min. No charge.*

Through lavish use of animation and color, this new film shows how zinc functions to control the corrosion of iron and steel by acting as a barrier and by affording galvanic protection. It then explains methods of coating steel stock or products with zinc, and surveys the various fields of usefulness for zinc-coated parts.

Continuous galvanizing lines are shown, as well as the hot-dip galvanizing of large structural parts, and demonstrations are given of corrosion prevention with zinc as cathodic protection, metallizing, Sherardizing, and painting.

•

THE STORY OF EMERI-CRETE—*Produced by Walter Maguire Co Inc, 60 E 42 St, New York, N Y. 16 mm, sound, color. Running time 25 min. No charge.*

The preparation and application of Emeri-Crete flooring for heavy industrial use is demonstrated in this new picture. The mining of Cortland emery, crushing, screening, and packaging, and its use as a cement aggregate constitute an important part of the film. Also shown are actual laboratory tests for compression and tensile rating, and applications of the material in various plants.

•

PRESSURE ON EXTRUSION PRODUCTION—*Produced by Lake Erie Engineering Corp, Box 68, Kenmore Station, Buffalo 17, NY. 16 mm, sound, color. Running time 25 min. No charge.*

Aluminum, brass, and steel extrusion processes are described, with particular emphasis and explanation

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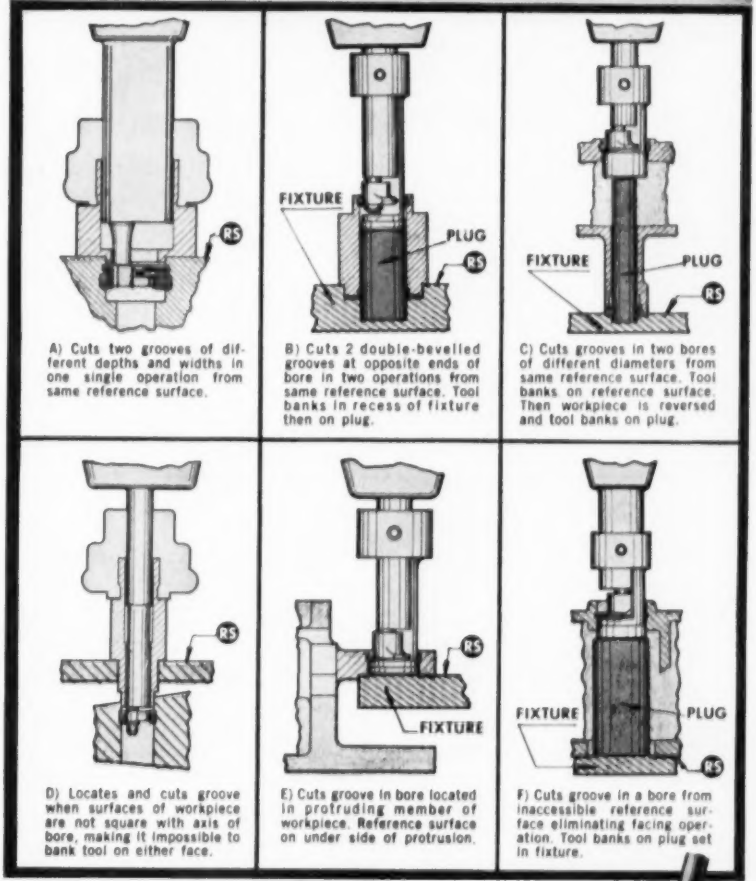

A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

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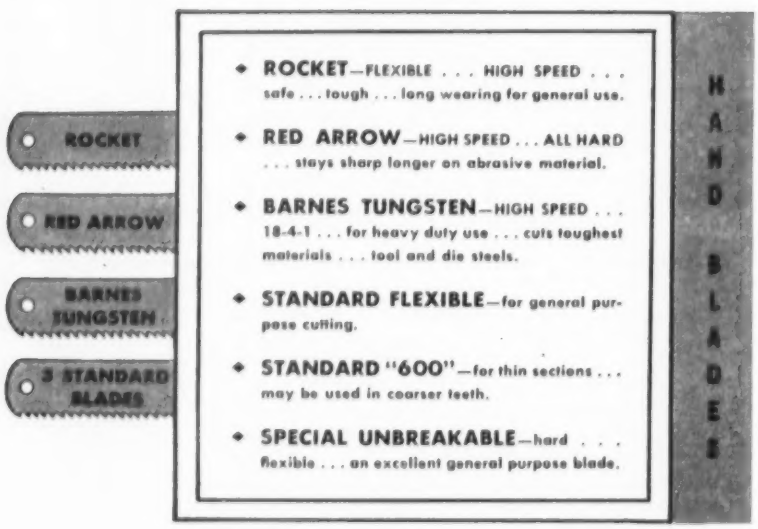
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◆ ROCKET—FLEXIBLE . . . HIGH SPEED . . . safe . . . tough . . . long wearing for general use.
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◆ BARNES TUNGSTEN—HIGH SPEED . . . 18-4-1 . . . for heavy duty use . . . cuts toughest materials . . . tool and die steels.
◆ STANDARD FLEXIBLE—for general purpose cutting.
◆ STANDARD "600"—for thin sections . . . may be used in coarser teeth.
◆ SPECIAL UNBREAKABLE—hard . . . flexible . . . an excellent general purpose blade.
HAND BLADES

Barnes Hack and Band Saw Blades are carried in stock by your Barnes Industrial Distributor. Call him for help on selecting the right blade for your job and for immediate delivery.

when cutting counts BARNES count on Barnes

W. O. BARNES CO., INC.
1297 TERMINAL AVE. • DETROIT 14, MICH.

given to the interaction of press components during the extrusion cycle for aluminum. Loading, sealing, extruding, stripping, and shearing are visualized for the various types of presses. Of special interest are the scenes demonstrating the Ugine-Sejournet technique for the extrusion of hot steel, using glass as a lubricant. Specific treatment is given to the patented Lake Erie rotary die-slide mechanism, along with the special loading arrangement and a comparison between long- and short-stroke presses.

Names in the News . . .

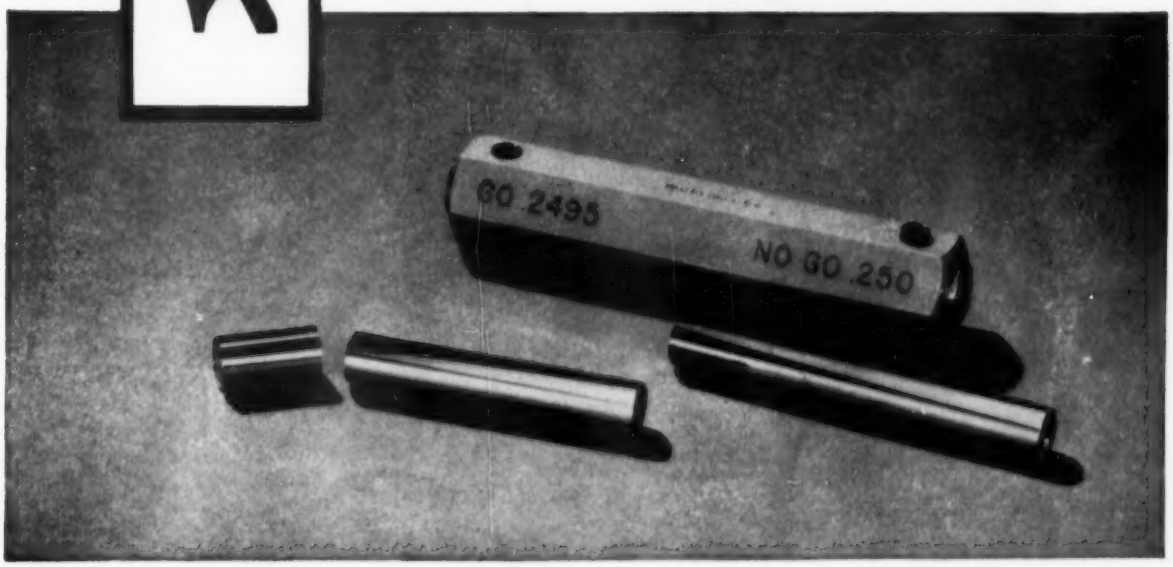
George G George, former Detroit district sales manager for Rockwell Manufacturing Co's Delta Power Tool Division, has been appointed a member of the new specialty products sales department of the Division. The group has been set up to specialize in Delta metalworking lathe sales and service. Also appointed are **Herbert Gegenhuber**, Iowa district sales manager; **Jack Steele**, district sales manager in the Los Angeles area; **Harold Jonas**, Connecticut district sales manager; and **Douglas R Finch**, formerly associated with Mall Tool Co of Chicago.

A Robert Lafond has been appointed assistant sales manager of the steel shelving and bins division of Burroughs Manufacturing Co of Kalamazoo, Mich. He was formerly associated with the Mills Morris Co of Memphis, Tenn, as sales manager of the steel products division. **Robert Cody**, a Burroughs district sales manager, has been promoted to assistant sales manager of metal office furniture.

Murray Simpson has been elected an assistant vice president of W L Maxson Corp, New York producers of precision equipment for aircraft and missiles. Prior to joining Maxson, Mr Simpson directed the development of a missile guidance system at Fairchild Guided Missiles Division.

Robert S Robinson, product manager of Allegheny Ludlum Steel Corp, has been named administrative assistant to the vice president in charge of sales. **Fred W Kies-**

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED *and* MONEY SAVERS...

because they're "Cut-Off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below ⅜" may be cut off when ends become worn and as many as from five to ten gages made available from the 1⅞" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XXX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 36, available on request.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

37th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

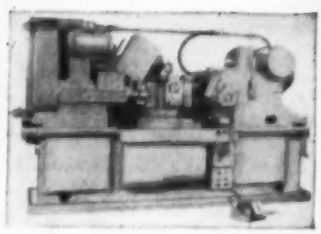
Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

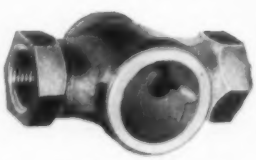
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.





A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

hauer, electrical sales engineer, has been promoted to product manager, magnetic laminations.

Robert R Freeman, formerly associated with Westinghouse Electric Corp in engineering and supervisory capacities, has joined Climax Molybdenum Co as manager of arc-cast molybdenum development.

P Dudley Kaley has been appointed sales manager for Pittsburgh Plate Glass Co's Fiber Glass Division, Pittsburgh.

John H McKenna has joined Roberts Numbering Machine Co, Brooklyn, NY, as vice president. He was formerly executive assistant to the president of Clifton Conduit Co.

Clarence L Johnson, chief engineer of Lockheed Aircraft Corp's California Division, has been named company vice president for research and development. **John B Wassall,** assistant chief engineer at the California Division, has been apointed director of engineering there. **M C Haddon,** chief project engineer, succeeds Mr Johnson.

Frank E Stehlik has been appointed general manager of General Electric Co's Low Voltage Switchgear Department at Philadelphia. He succeeds **R H Jones,** promoted to general manager, Air Conditioning Division.

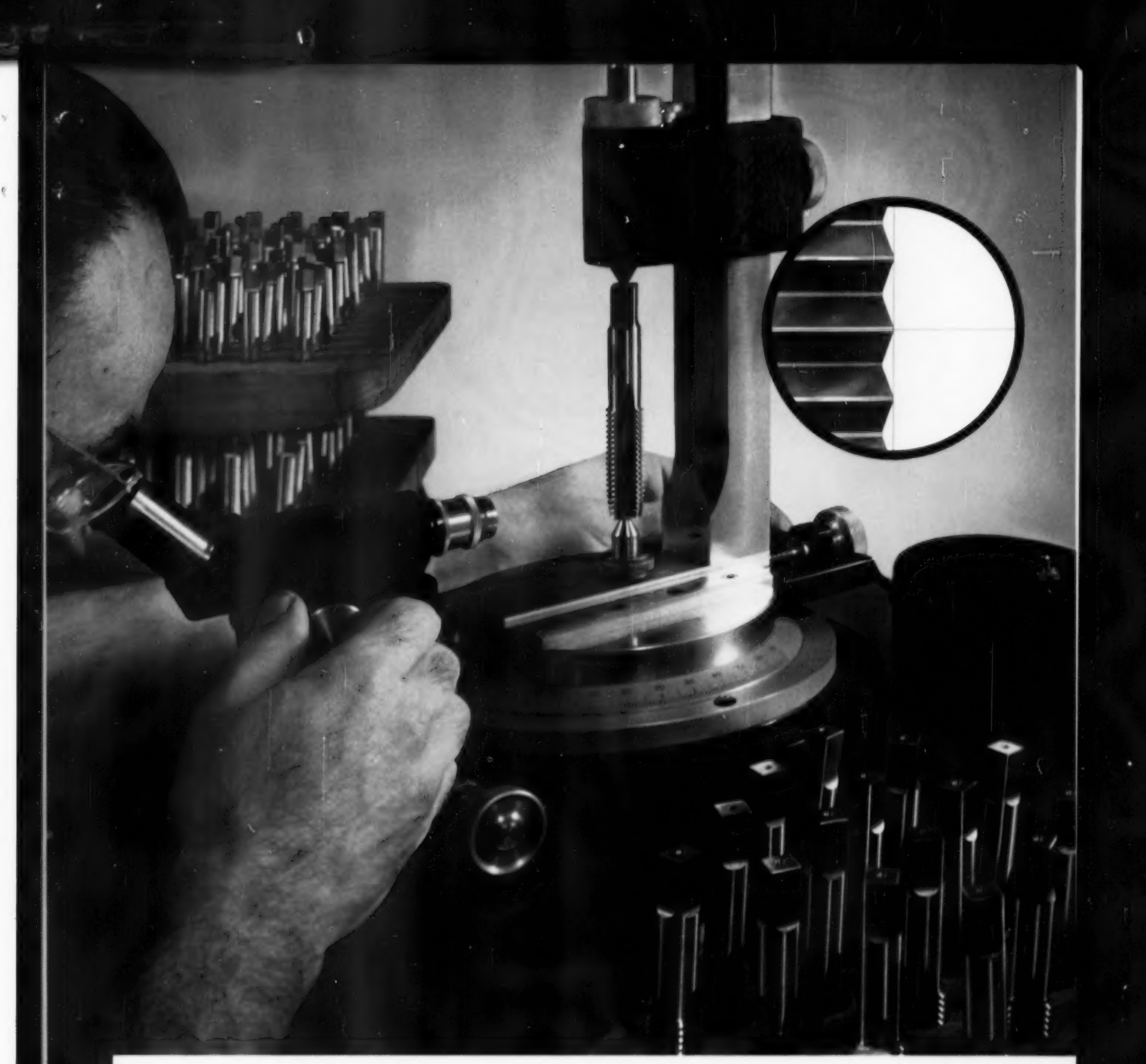
Roy Omans has been promoted from plant superintendent to factory manager of Superweld Corp, North Hollywood, Calif.

Al Gross, formerly vice president of Royalcall, Inc, Cleveland, has been named chief engineer of Cleveland Metal Specialties Co.

Wallis W Wood, formerly assistant works manager of Cleveland Graphite Bronze Co, has been appointed manager of Bohn Aluminum & Brass Corp's Plant 15 in Greensburg, Ind.

William R Mason has been appointed production engineer for Arcadia Metal Products, Fullerton, Calif.

D H Hamner has joined Parker Rust Proof Co as a member of the technical service department of the Automotive Division. He was formerly associated with General Motors Corp in the field of production metal finishing and painting.



Rake, or hook (curved rake), is an all important element in the cutting ability of a tap tooth. The angle required to cut tool steel will not do the same job on cast iron, or brass, or aluminum. For every material there is a best rake or hook angle.

Whether they are stock taps with standard rake or hook for general purpose tapping; special purpose stock taps for a specific material; or special taps, cutting angle could mean success or failure on the job.

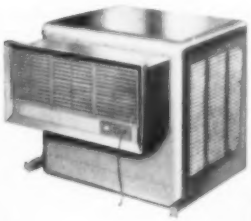
"Greenfield's" quality control includes checking this vital element on equipment especially designed for the purpose.

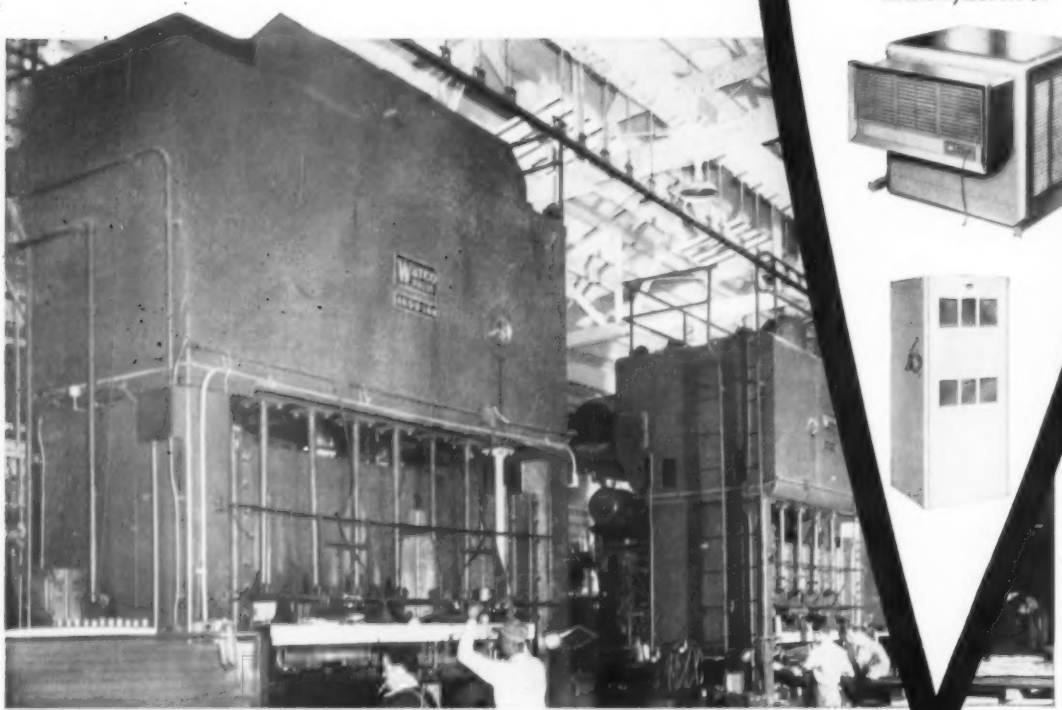
GREENFIELD TAP and DIE CORP.
GREENFIELD, MASS.

"Warco®

GIVES YOU A LOT FOR YOUR MONEY . . . . .

Says leading west coast appliance manufacturer



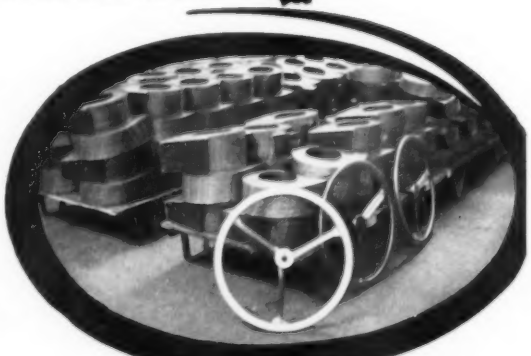


"Rugged, dependable, versatile, well designed," says tool and die head of these Warco Presses.

"I recommended Warco Presses because they are rugged, dependable, versatile and well designed pieces of equipment." This is a statment from John H. Abbott, head of the tool and die department of Utility Appliance Corporation, Los Angeles, one of the west coast's leading appliance manufacturers.

Included in the several Warco Presses now being operated at Utility are two 400-ton and two 250-ton Eccentric Gear Presses that have convinced Utility officials that "Warco Quality" is more than just an advertising phrase.

When next you're considering press equipment, why not let us put you in touch with a Warco user in your area. We believe your first Warco will convert you, too, to "Warco Quality Presses."



Samples of press production at Utility include these centrifugal blower parts.

Federal® WELDERS

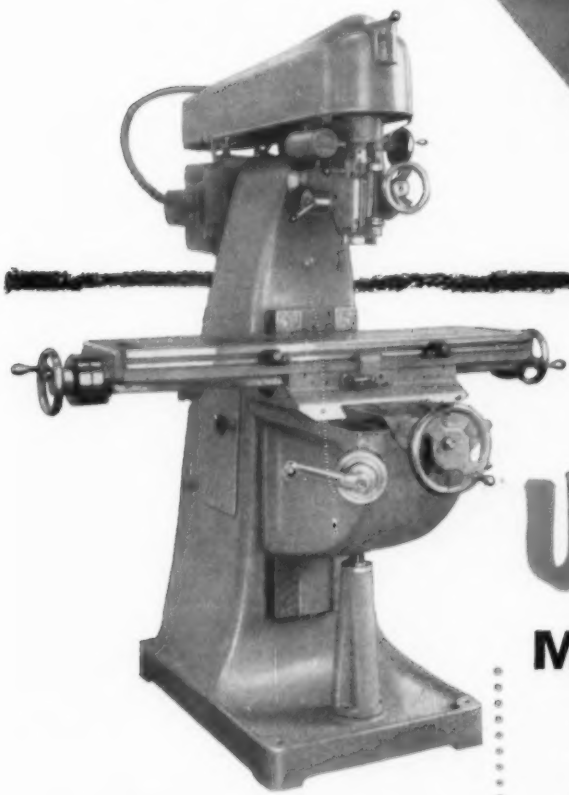
Warco® PRESSES

The Federal Machine and Welder Company

WARREN, OHIO

9937

Choice of hand or
power feed head and table



BALANCED RIGIDITY

assures
*CERTIFIED
ACCURACY

in the NEW

U.S.Vertical
MILLING MACHINE

Balanced rigidity, the key to accuracy for vertical and angular milling operations, is an integral part of the new U. S. Vertical Milling Machine.

These U. S. Vertical features provide rigidity for close tolerance work:

- Machine weighs 2000 pounds
- Extra wide bearing surfaces
- Motor mounted behind column, balances weight of head, resists vibration and deflection
- Major castings are internally ribbed, normalized, stress relieved, and internally braced
- Dovetails are deep and hand scraped
- Massive knee, saddle and table

Drive by B section V belt

***Tested 10 Ways!**

The accuracy of each U. S. Vertical Milling Machine is certified. A check sheet accompanies every machine listing 10 exacting operational tests the machine has passed. The check shows allowable tolerances and actual measured tolerances of the individual unit. A new bulletin provides complete specifications and illustrates various accessories available on the new U. S. Vertical Milling Machine. Write for your *FREE* copy today.

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MACHINE TOOL DIVISION

6 Brotherton Road
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Manufacturers of:
Burke Bench Mills, U. S. No. 1 Milling Machine and the radically new U. S. Quartet

Another Example of

VICKERS®

HYDRAULICS

in Automation

Ex-Cell-O Precision Cylinder Boring Machines shown below are finish-boring V-8 engine blocks. Like so many other high-production machines, these make generous use of hydraulics.

In addition to the advantages inherent in hydraulic control, Vickers Hydraulics gives you the benefits of a nation-wide company-operated field engineering and service organization to assure correct application and operation with least maintenance. Vickers has the complete line of hydraulic equipment necessary to take undivided system responsibility . . . to eliminate any risk of incompatibility of hydraulic components.

The Vickers Application Engineer near you will be glad to demonstrate the many benefits you can obtain by using Vickers Hydraulics. Write for a copy of Catalog 5002B.

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DIVISION OF SPERRY RAND CORPORATION

ADMINISTRATIVE and ENGINEERING CENTER

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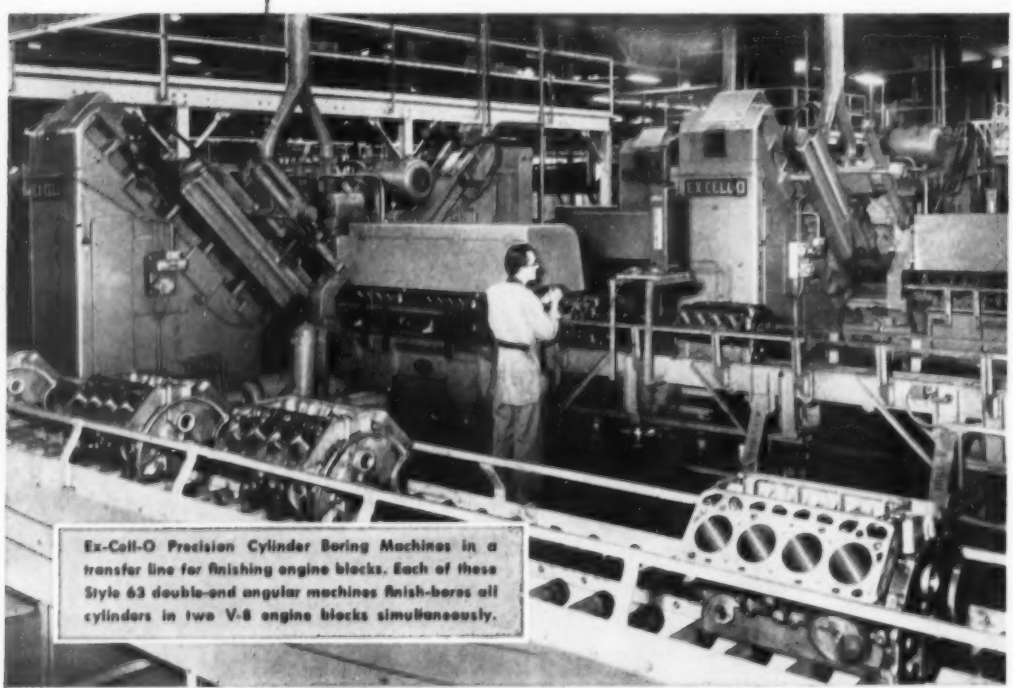
Engineers and Builders of Oil Hydraulic Equipment Since 1921



Ex-Cell-O Precision Cylinder Boring Machines in a transfer line for finishing engine blocks. Each of these Style 63 double-end angular machines finish-bores all cylinders in two V-8 engine blocks simultaneously.

Representative VICKERS Units Used on Ex-Cell-O Precision Cylinder Boring Machines

Two-Pressure Pump

Insures lower maintenance cost and saves horsepower and heat in two-pressure hydraulic circuit. Automatically provides high volume at low pressure and low volume at high pressure.

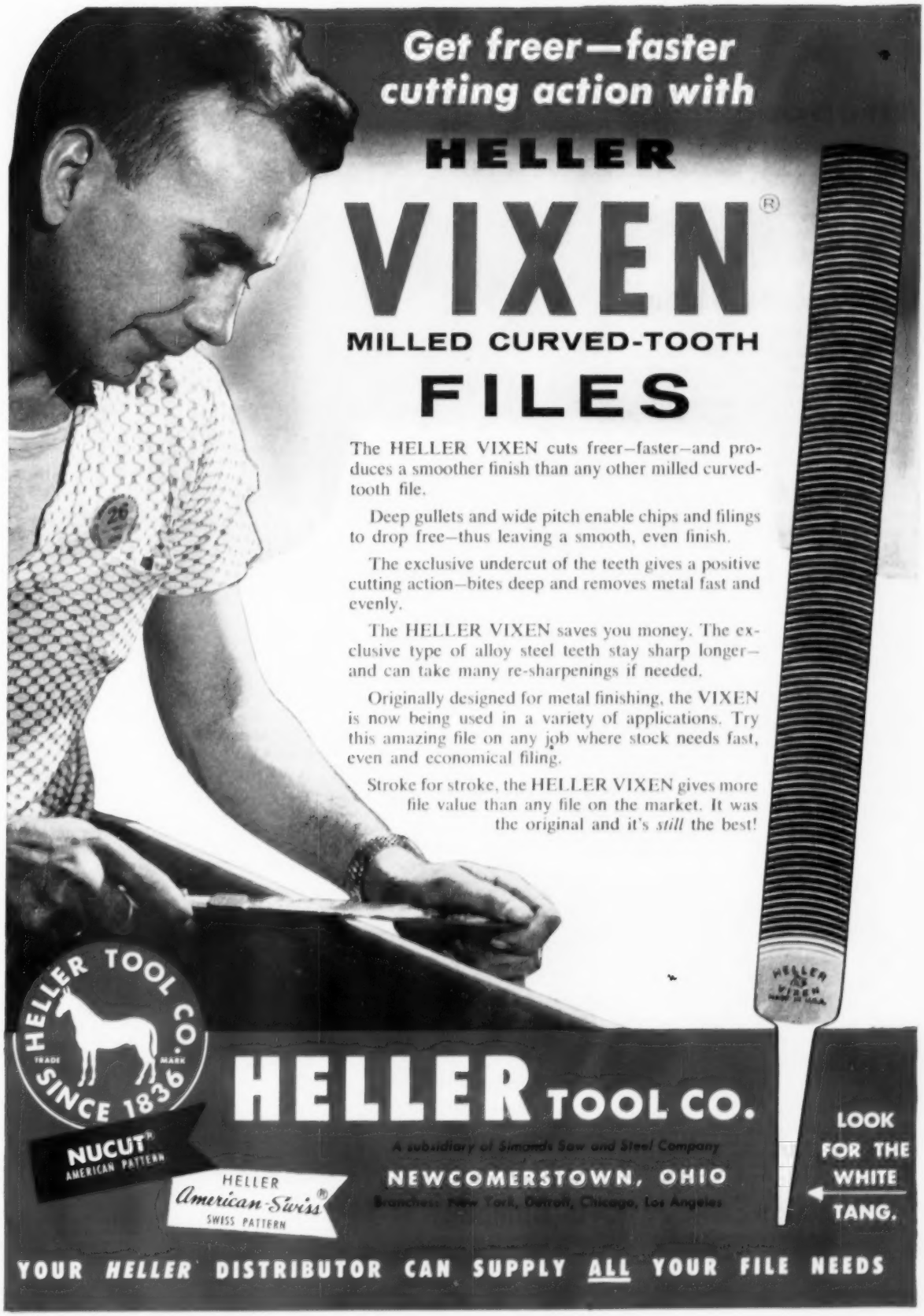
Solenoid Controlled Pilot Operated 4-Way Valve

Compact and versatile "sandwich" construction. Gasket mounting simplifies installation and overhaul . . . also minimizes piping.

Traverse and Feed Cycle Control Panel

Maintains smooth and constant preset feed rate regardless of fluctuations in cutting tool resistance or hydraulic pressure.

7350


Get freer—faster cutting action with
HELLER
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MILLED CURVED-TOOTH
FILES
The HELLER VIXEN cuts freer—faster—and produces a smoother finish than any other milled curved-tooth file.
Deep gullets and wide pitch enable chips and filings to drop free—thus leaving a smooth, even finish.
The exclusive undercut of the teeth gives a positive cutting action—bites deep and removes metal fast and evenly.
The HELLER VIXEN saves you money. The exclusive type of alloy steel teeth stay sharp longer—and can take many re-sharpenings if needed.
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Stroke for stroke, the HELLER VIXEN gives more file value than any file on the market. It was the original and it's *still* the best!
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Branches: New York, Detroit, Chicago, Los Angeles
LOOK FOR THE WHITE TANG.
YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

Stroboscopic Light

for the design of Better Turbine Blades

The control of the complex vibrations of large turbine blades and parts is one of the most difficult problems facing the steam-turbine designer. Careful, thorough design is needed if these rapidly moving elements are to operate satisfactorily at extremely high pressures and temperatures for a normal life expectancy of 20 to 30 years.

At the Westinghouse Electric Corporation, engineers have found the General Radio Strobotac and Strobolux a considerable aid in studying the vibration-damping characteristics of turbine material. An electromagnetic exciter maintains a sample bar in vibration, while stroboscopic light produces a stationary image. The bar's vibration amplitude can then be accurately measured with a microscope.

High intensity, short-duration flashes of stroboscopic light make possible *detailed visual observation* of the vibratory deflection patterns in "*slow motion*". Because stroboscopic light does not in any way affect the vibration performance or other characteristics of the test specimen, this technique has proven invaluable in the development of blades for turbines of all types.

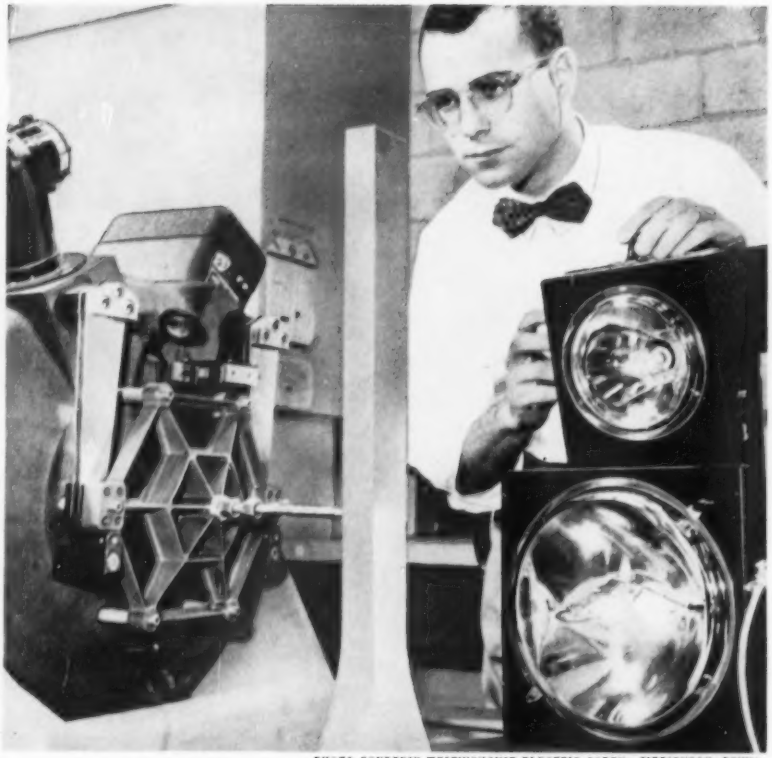


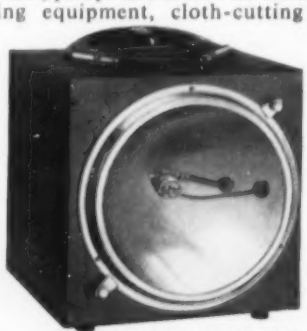
PHOTO COURTESY WESTINGHOUSE ELECTRIC CORPN., PITTSBURGH, PENNA.

Stroboscopic light has a wide field of application. This versatile tool can be applied to a wide variety of mechanical and electromechanical problems. General Radio Stroboscopic Instruments have been used to detect resonant modes in equipment to be mounted in aircraft and to inspect armatures and other moving parts of high-speed rotating machinery. Other uses include detailed examinations of the operation of . . . governors and automotive fuel-injection devices, office dictating equipment, pumps and fans in air-conditioning equipment, cloth-cutting and envelope-folding machinery, centrifuges used in forming jet-engine rings, magnetic-tape systems in high-speed computers, phonograph and other small instrument and timing motors.

Clear, stationary images of rapidly moving objects are produced with the aid of the G-R Strobotac . . . Strobolux . . . or Strobolume . . . where it is impossible to see this movement with the unaided eye. For this reason, these instruments are used in a wide variety of work. Leading manufacturers have found this equipment indispensable in research, production-testing and maintenance work of all kinds.

Type 631-BL STROBOTAC®

. . . self-contained, portable, operates from 115-v, 60 cycles . . . basic stroboscope unit for visual examination of rapidly moving parts and mechanisms and for use as a versatile tachometer for speed measurements . . . direct-reading range of flash repetition rate is 60 to 14,400 rpm; instrument will "stop" motion to 100,000 rpm . . . **Price $155.**



Type 648-A STROBOLUX®

. . . produces light intensity 100 times that of Strobotac . . . flash rate up to 6000 per minute . . . operates from Strobotac . . . **Price $235.**

Type 1532-B STROBOLUME

. . . high intensity illumination 500 times that of Strobotac . . . flash rate up to 1200 per minute, up to 3000 per minute at reduced intensity . . . flash rate controlled by Strobotac, G-R Contactor, or "homemade" make-break mechanism . . . **Price $265.**

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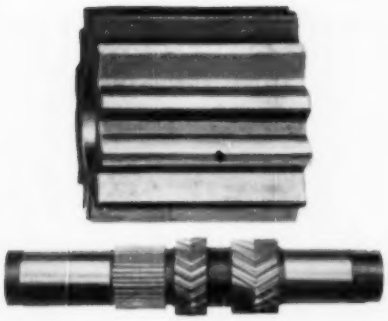
920 S. Michigan Ave. **CHICAGO 5** 1000 N. Seward St. **LOS ANGELES 38**

G-R Stroboscopic instruments can help you. There's use for them wherever there are moving parts or mechanisms and repetitive operations of any kind, and that includes just about every plant. Write for the G-R Stroboscope Bulletin.



8 PRECISION GEARS

...all generated on a single Farrel-Sykes machine

Those eight gears should give you some idea of the versatility of a Farrel-Sykes "Twin-Head" generator.

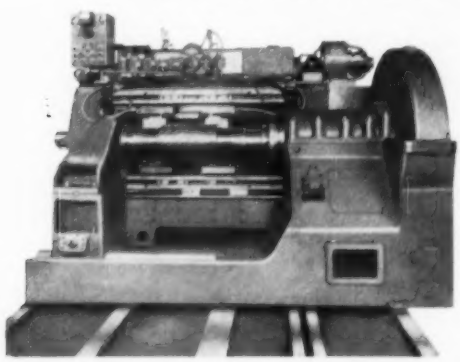
The gear machine is made with the work axis horizontal, the position in which the gears themselves run. This permits a wide variety of work to be handled on a single generator—controls the work positively, too.

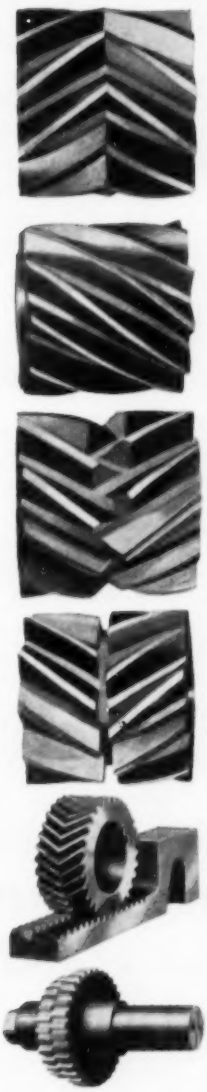
Built with high initial precision, "Twin-Head" generators are provided with means of compensating for wear and sustaining accuracy for thousands of operating-hours. Other important benefits are faster cutting speed, reduced setup time, and ease of operation.

Write for details of this versatile gear generator, today.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.), Akron, Cleveland, Chicago, Los Angeles, Houston





Types of gears illustrated (from top to bottom): spur • gear component with integral shaft • continuous-tooth herringbone • single helical • double helical with staggered teeth • double helical, staggered-tooth, with center groove • herringbone rack and pinion • cluster.

Farrel-Birmingham®

FB-1032

SUB-LANDS

OFF THE SHELF!

ALL TYPES ...
ALL SIZES ...
ALL SHANKS ...

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- DRILL CHAMFER
- DRILL COUNTERBORE
- DRILL REAMER
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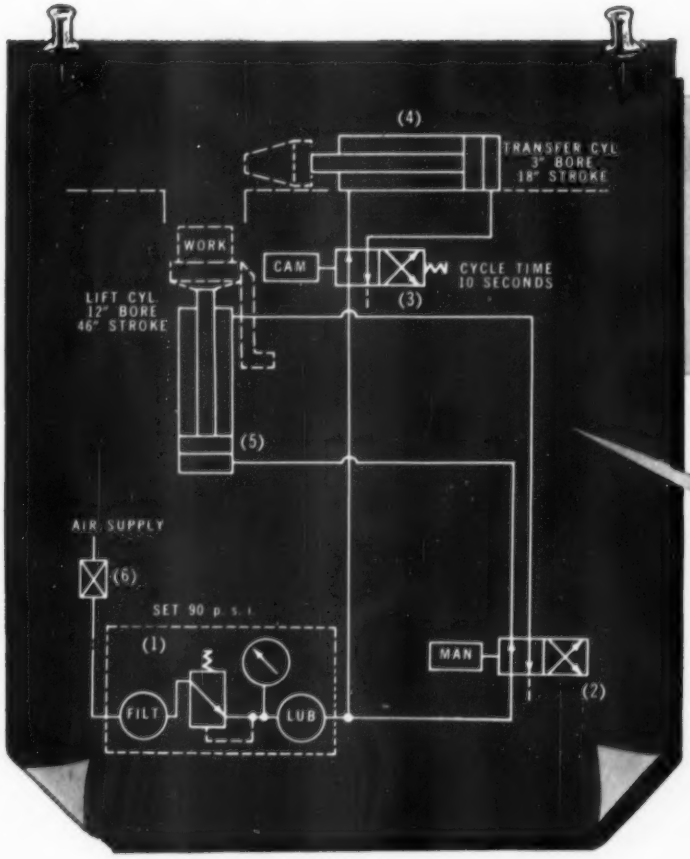
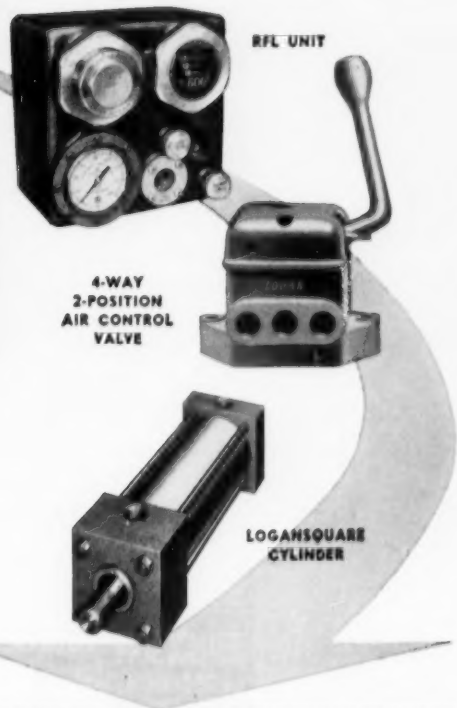


Logan
AIR CIRCUITS



Write for FREE "Circuit Rider" booklet. It explains the above circuit plus many others.

how important is the RIGHT CIRCUIT?

One can't overestimate the importance of a properly designed and equipped circuit. Logan-designed circuits are operating all over the world. Let Logan engineers help you design the circuit to meet your production requirements. For a dependable ONE-SOURCE supplier of air and hydraulic equipment . . . specify Logan.

SAVES TIME Logan AIR AND HYDRAULIC EQUIPMENT EFFORT-MOTION

MEMBER
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Your dependable SINGLE SOURCE for all air and hydraulic equipment

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818 CENTER AVENUE, LOGANSPORT, INDIANA

Please Send Copy of Catalog:

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- ☐ 100-2 MILL-TYPE AIR CYLINDERS
- ☐ 100-3 AIR-DRAULIC CYLINDERS
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLS.
- ☐ 100-5-1 ULTRAMATION CYLS.
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 62 SURE-FLOW PUMPS
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- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

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Which will it be—?

Price
Cost

As you well know, *price* of new equipment is only the beginning. Actual production savings determine real equipment *cost.*

From this realistic *cost* standpoint you can't beat Erickson collet chucks. Here's why:

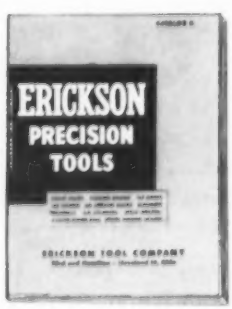
Guaranteed accuracy of .0005" and superior gripping power of Erickson collet chucks assure proper drill alignment. Drills then cut evenly on both cutting lips permitting faster machine feeds and proper speeds . . . give more holes per grind.

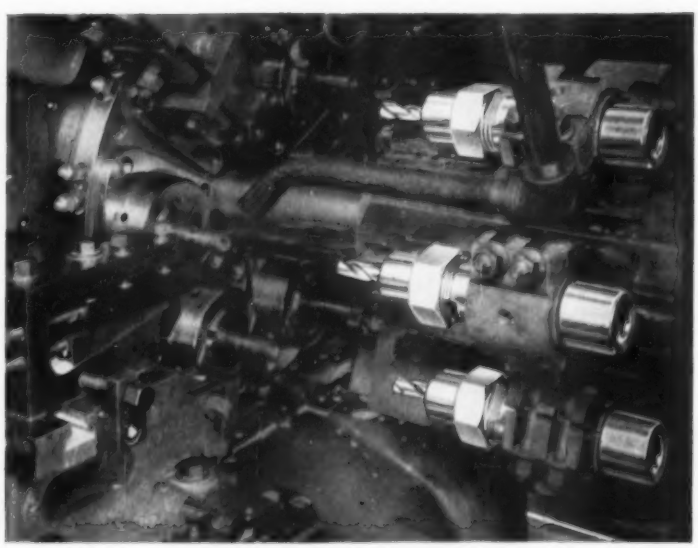
What's more, ease of operation greatly reduces set-up time and since Erickson chucks can grip on the flutes, you can stub your drills . . . extend tool life . . . maintain accuracy.

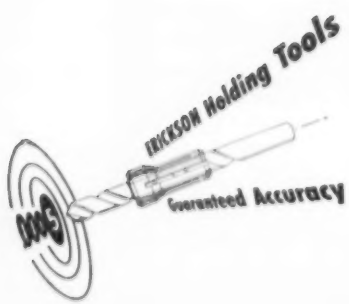
Send for new Catalog K today! It gives the complete Erickson story. You'll find many interesting applications for all Erickson holding tools.

A-5592

ERICKSON TOOL COMPANY 2309-6 Hamilton Ave., Cleveland 14, Ohio







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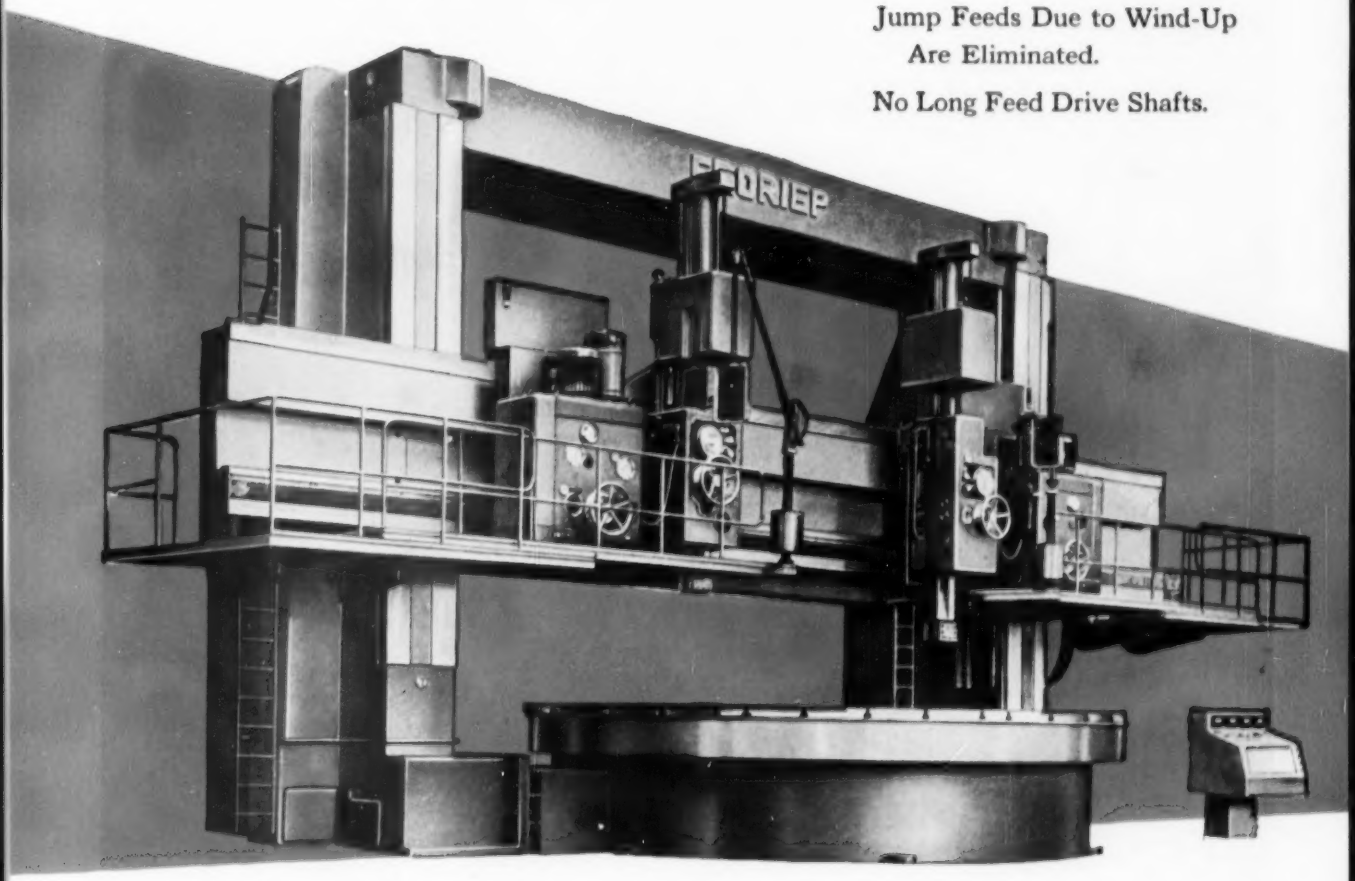

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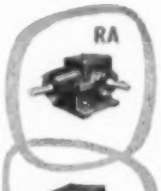

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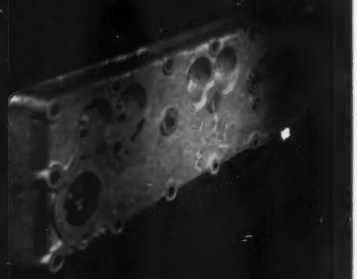

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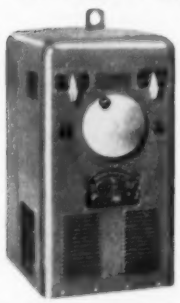

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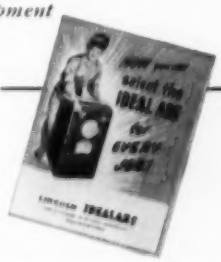

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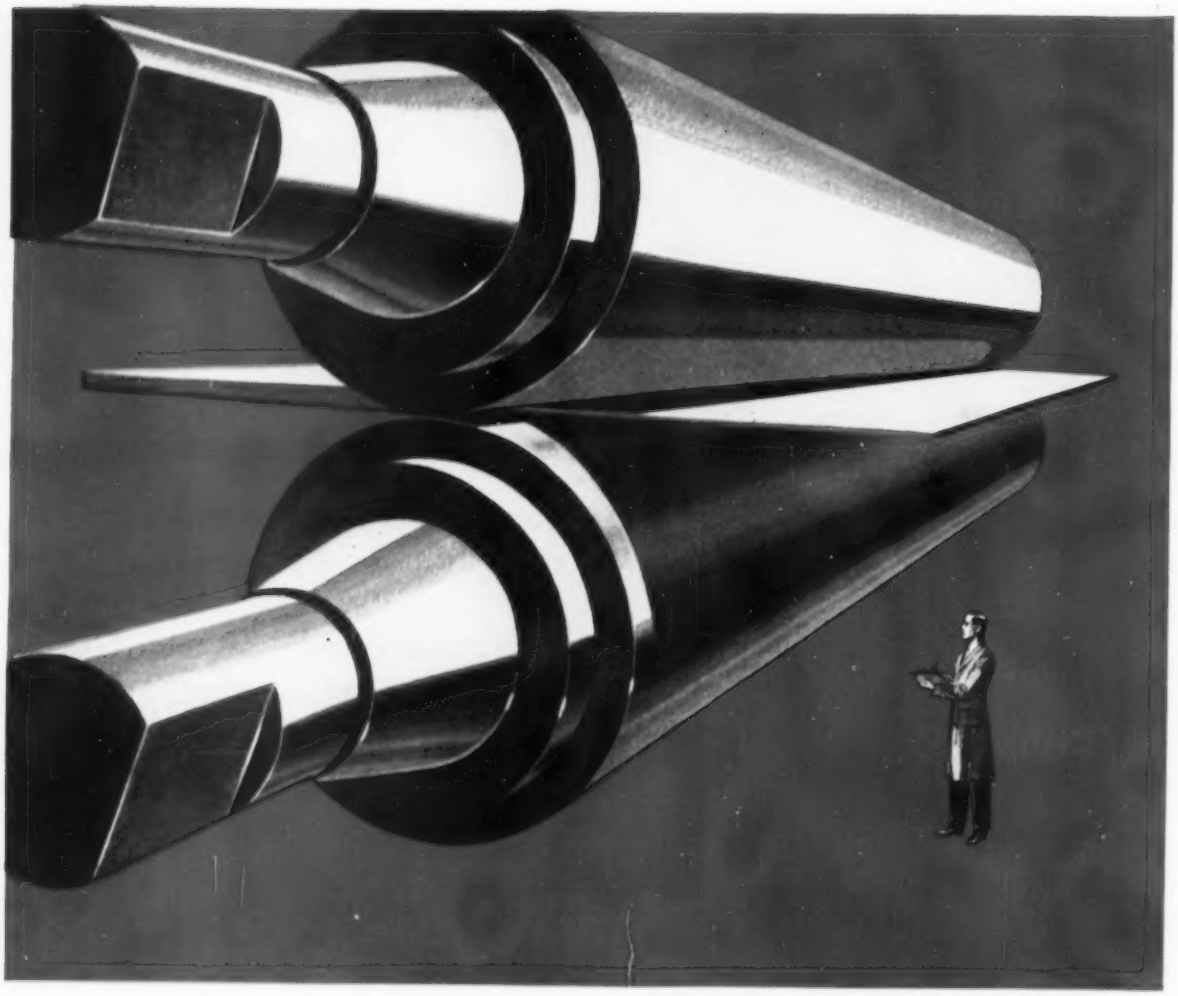

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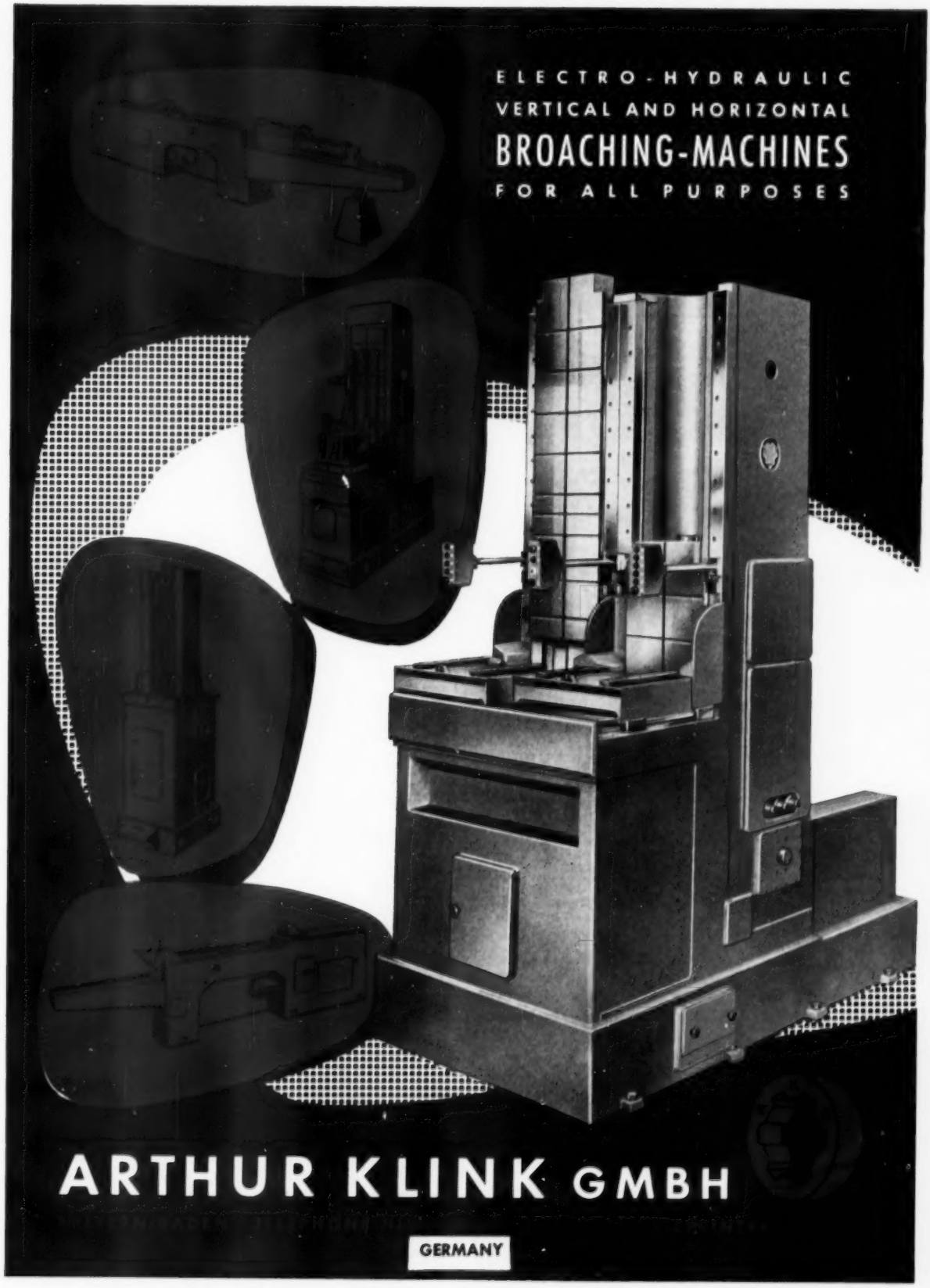
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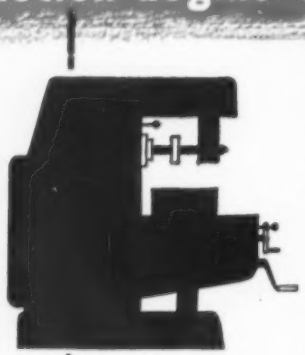

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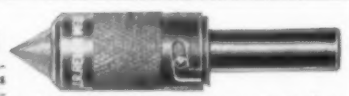

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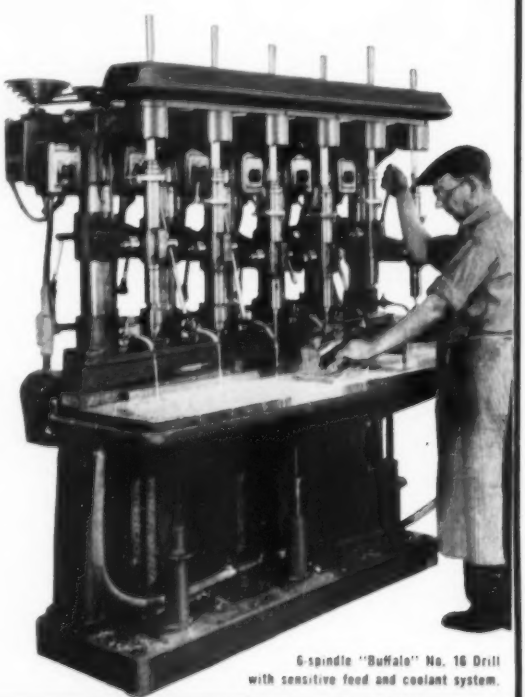

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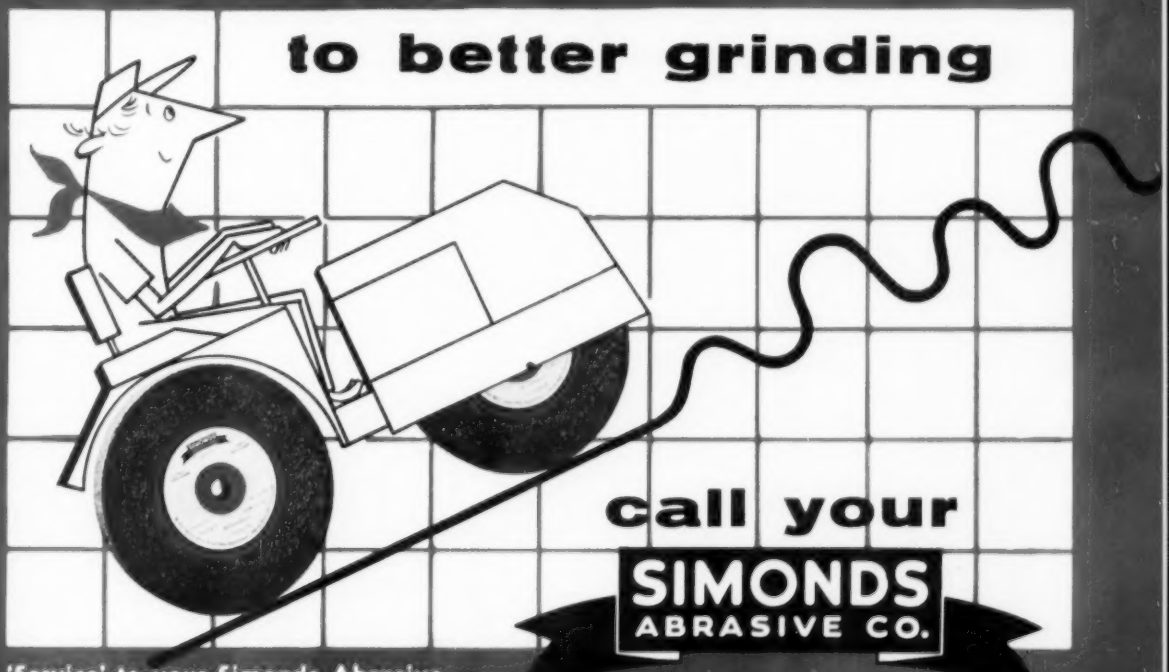

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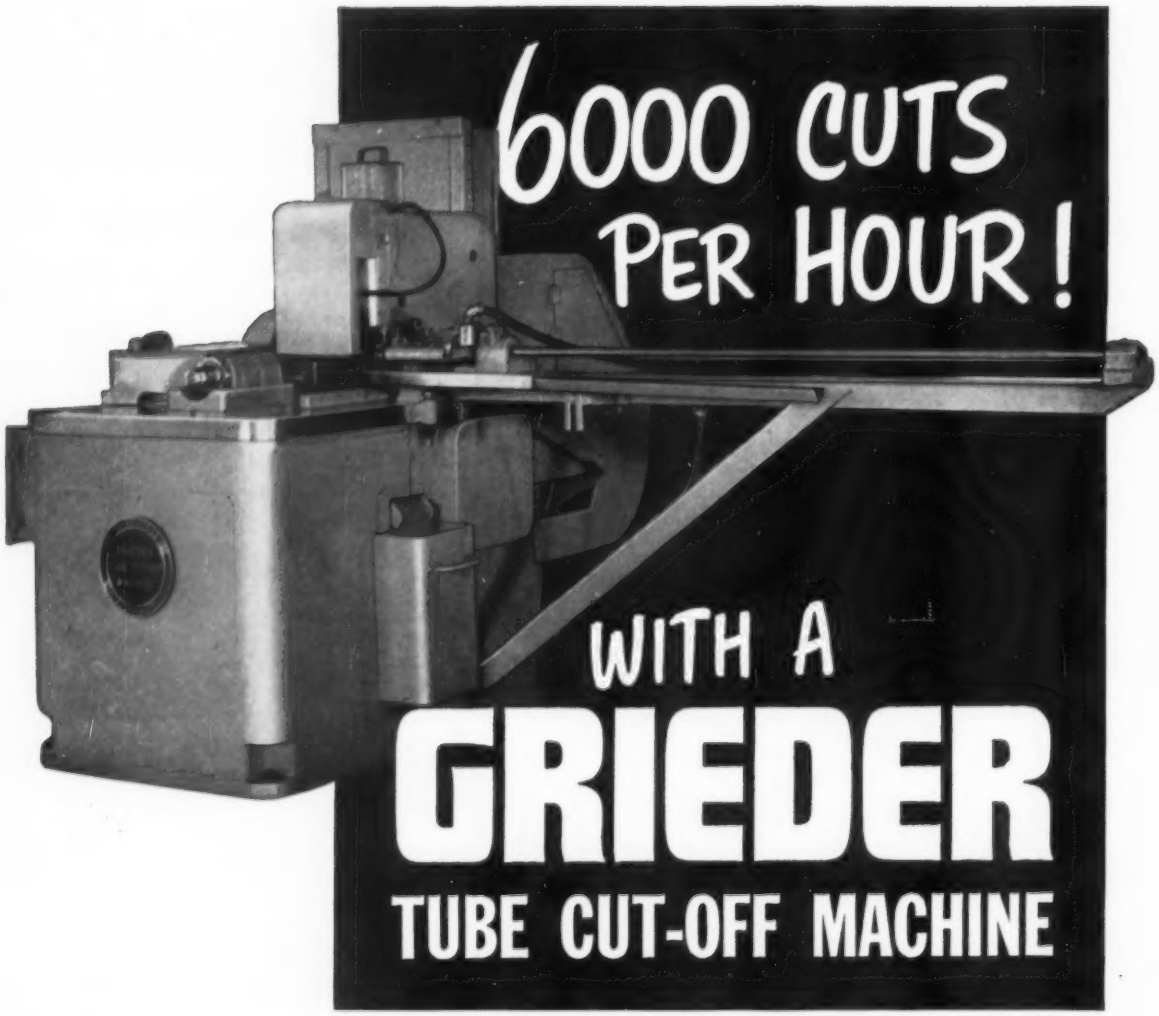

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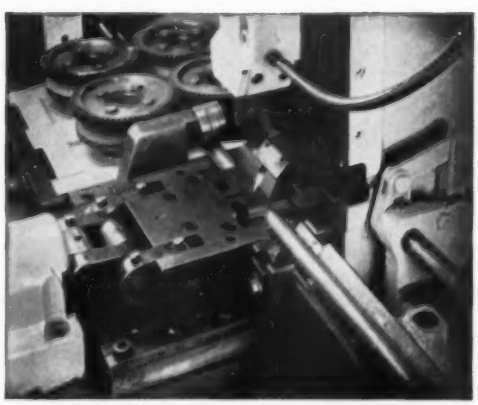

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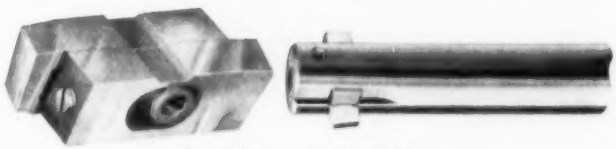

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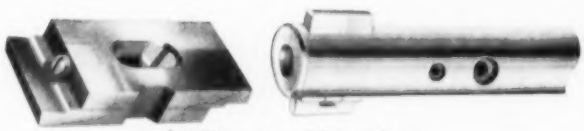

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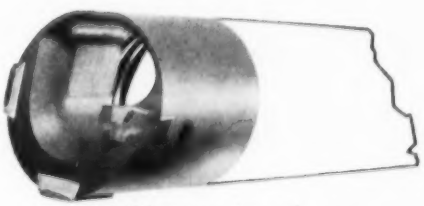

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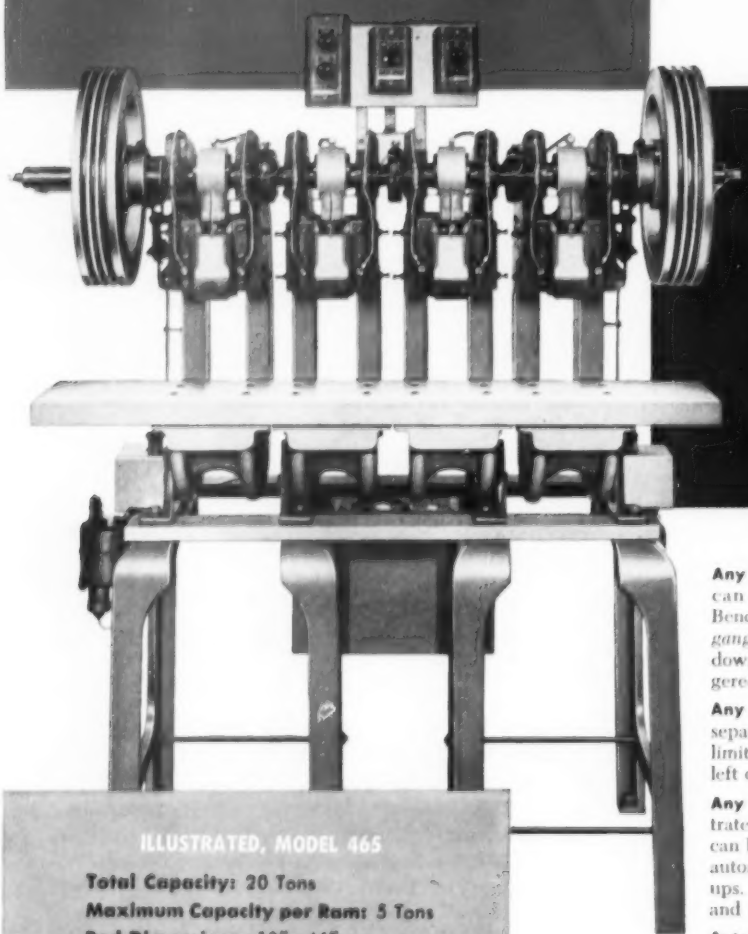

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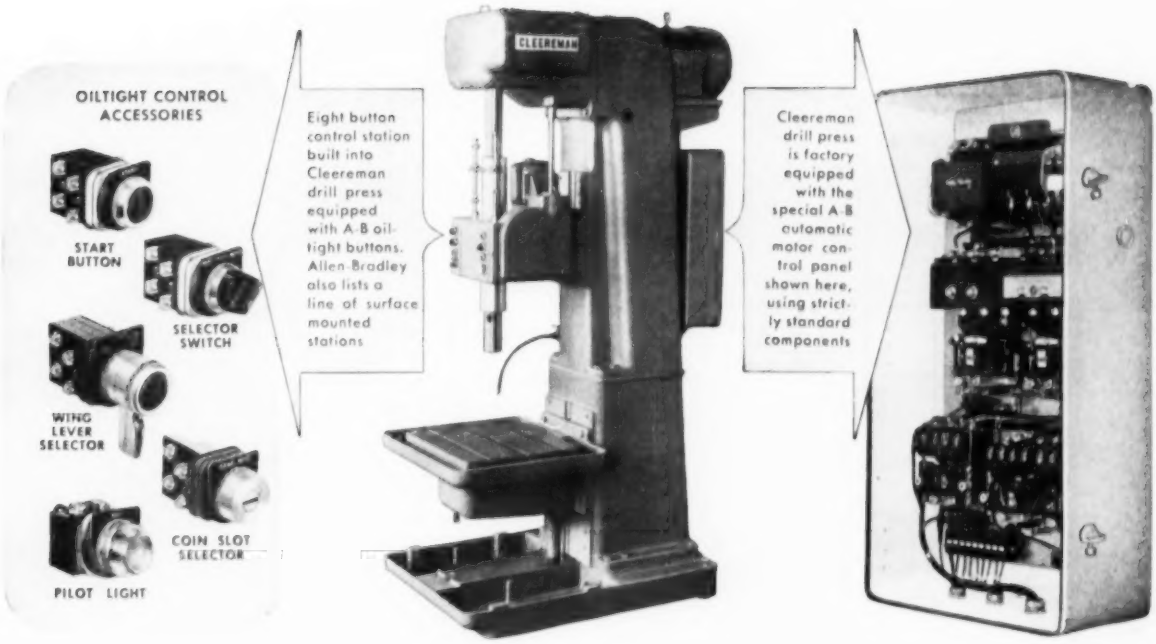
World's largest manufacturer of small punch presses and mills.

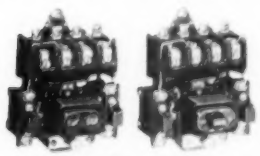

OILTIGHT CONTROL ACCESSORIES
START BUTTON
SELECTOR SWITCH
WING LEVER SELECTOR
COIN SLOT SELECTOR
PILOT LIGHT
Eight button control station built into Cleereman drill press equipped with A-B oiltight buttons. Allen-Bradley also lists a line of surface mounted stations
CLEEREMAN
Cleereman drill press is factory equipped with the special A-B automatic motor control panel shown here, using strictly standard components

FOR DEPENDABLE AUTOMATION • • STANDARDIZE ON ALLEN-BRADLEY CONTROLS

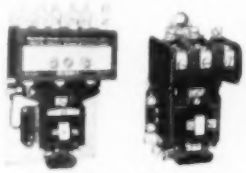
Control panels for an automation line of special machinery must be ultradependable to make the installation a success. The failure of a single item in the control sequence may shut down the entire production line. That is why all electrical and magnetic components must be good for *millions* of *trouble free operations.*

A-B Quality

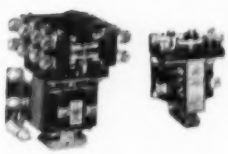
All Allen-Bradley control components, of which a few are shown below, have been time-tested in thousands of industrial applications. They are QUALITY products designed for trouble free service in the toughest automation layouts. Permit us to discuss your control requirements with you. Call on the nearest Allen-Bradley district office.



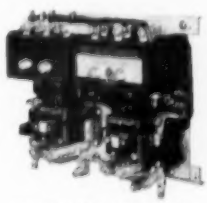
SOLENOID STARTERS
With push buttons • with selector
The Form 2 construction is for remote control



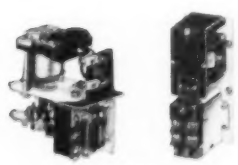
CONTACTORS
From one to eight poles
Ratings up to 1000 amps



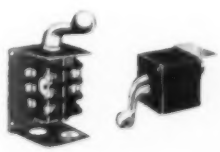
SOLENOID RELAYS
In a wide variety of types



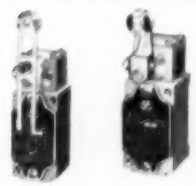
REVERSING STARTERS
Up to 600 hp, 440-550 v



TIMERS
Motor-driven • pneumatic
Other types available



DRUM CONTROLLERS
Up to 500 hp, 440-550 v



OILTIGHT LIMIT SWITCHES
A complete line

TERMINAL BLOCKS
Interlocking to any length

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SOLENOID MOTOR CONTROL
QUALITY

Allen-Bradley Co.
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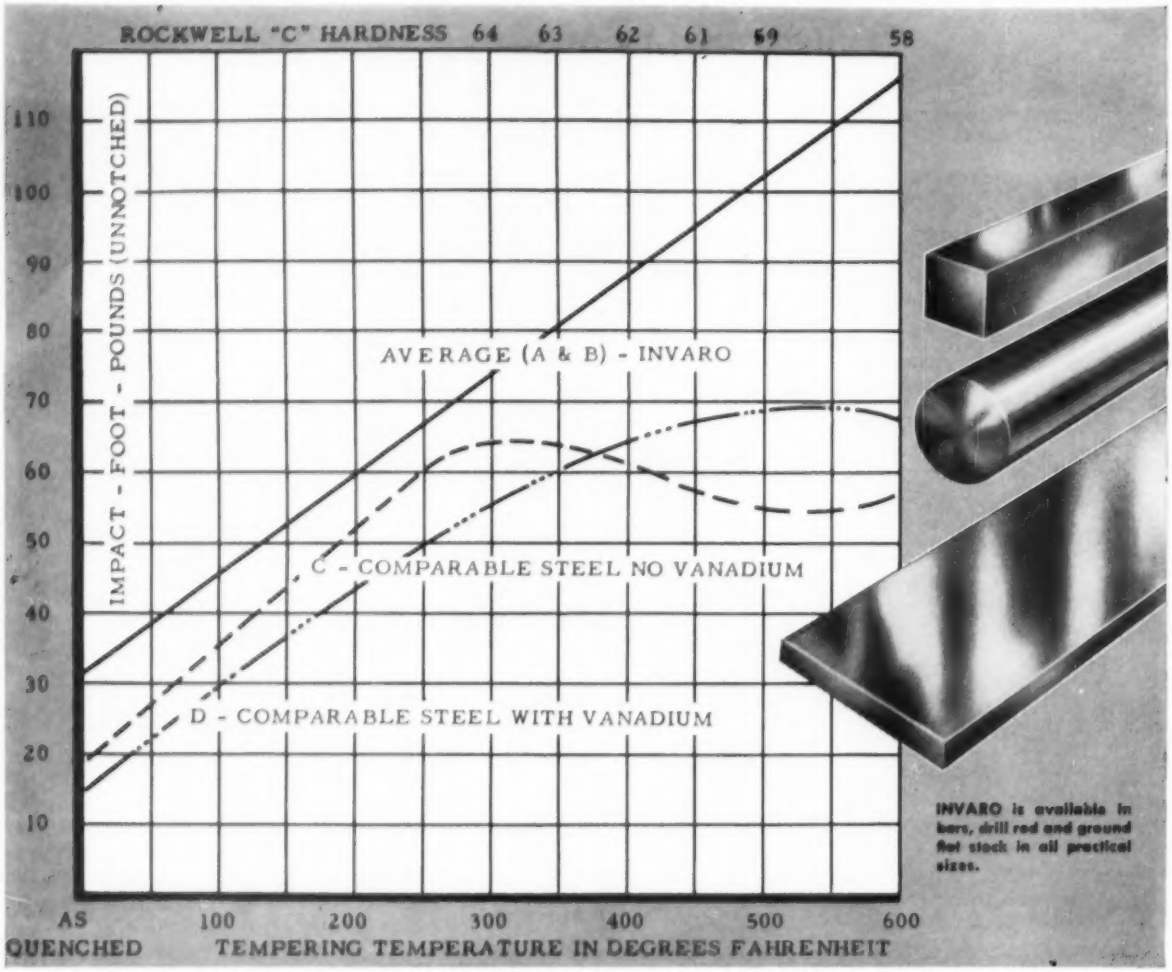

INVARO . . . *IZOD-PROVED* THE TOUGHEST
of leading comparable oil-hardening tool and die steels

When the toughness of a tool and die steel is the critical factor of selection, Firth Sterling INVARO is the *toughest* of the tough! That's not just an opinion but a *fact.* Undeniable proof is established by the A.S.T.M. Izod Impact Test, results of which are graphically shown above, comparing steels both with and without vanadium.

INVARO shows a superior toughness in *all* ranges of temperature from a minimum advantage of about 12% to as much as 100% greater! This marked superiority is the result of Firth Sterling's advanced metallurgical practices combined with 67 years of experience in the art of making specialty steels.

Yes, when you want *toughness* in your tools and dies, combined with uniformity, excellent hardening properties and safety in heat treating . . . specify INVARO.

Chemical Analysis	*All test samples were machined from half-inch annealed bar stock.*							
	C	Si	Mn	S	P	W	V	Cr
Invaro A	.88	.34	1.22	.010	.020	.49	.19	.50
Invaro B	.94	.25	1.20	.014	.013	.53	.22	.49
Comp. C	.90	.33	1.24	.011	.025	.50	—	.55
Comp. D	.95	.34	1.27	.010	.020	.50	.21	.59

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

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High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

dixi 60

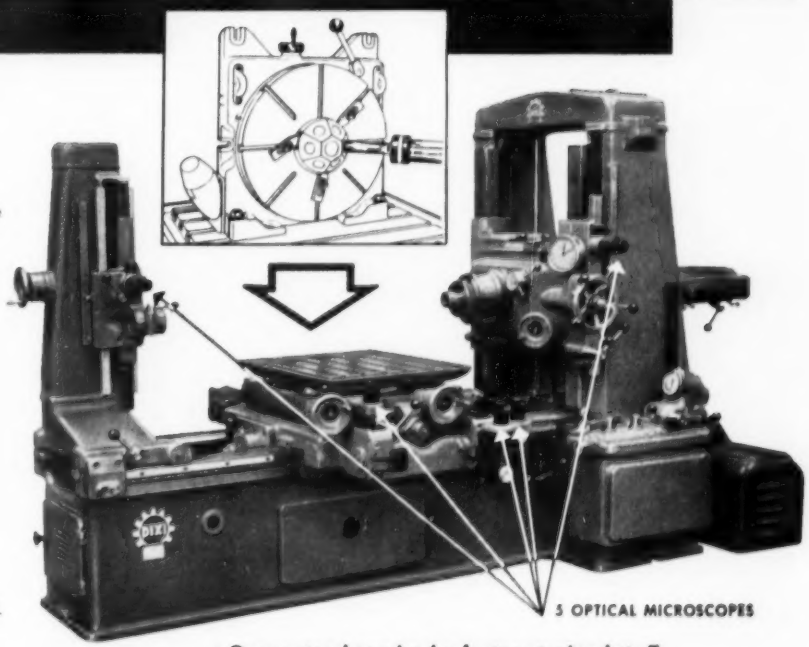
horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

ACCURACY
Overall accuracy of .0002"



A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.

- ***Guaranteed service by factory trained staff***
- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

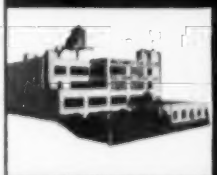
DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request

SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.

MBI



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export & import ltd.

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"Over 20 years experience in designing & building machinery"

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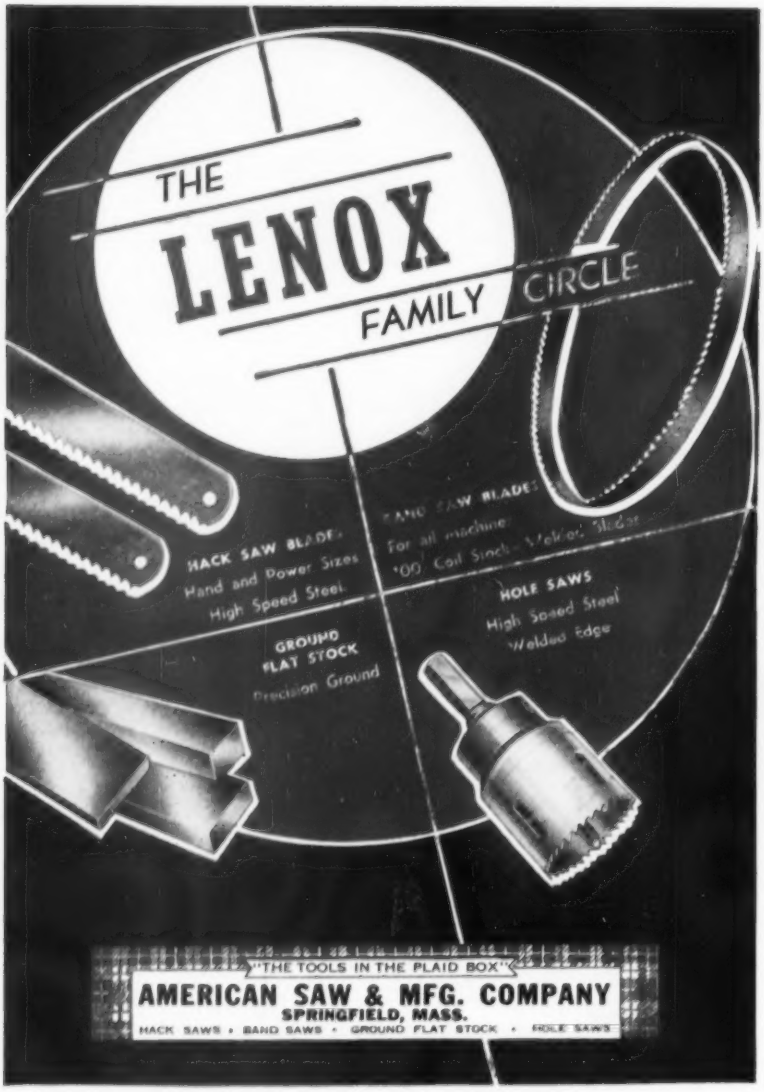

25" SWING FOR BIG JOBS —ACCURACY FOR PRECISION JOBS

SOUTH BEND 16–24" LATHE

Here's a lathe that will handle large diameter medium weight jobs with ease. Yet it has the speed and precision for efficient operation on small diameter work.

Swings 25⅛" over bed, up to 102" between centers. Exceptional choice of tools and attachments. 6, 8, 12 or 16 spindle speeds, 48 longitudinal, cross and threading feeds. Prices start at $2,559. *Write for catalog.*

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA

Builders of Lathes, Milling Machines, Shapers, Drill Presses and Pedestal Grinders.

STEP UP PRODUCTION 20% +

. . . for most lathes to 1" bar stock capacity

- Holds delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

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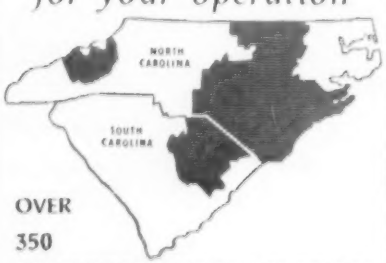
for your operation



OVER 350 COMMUNITIES TO CHOOSE FROM

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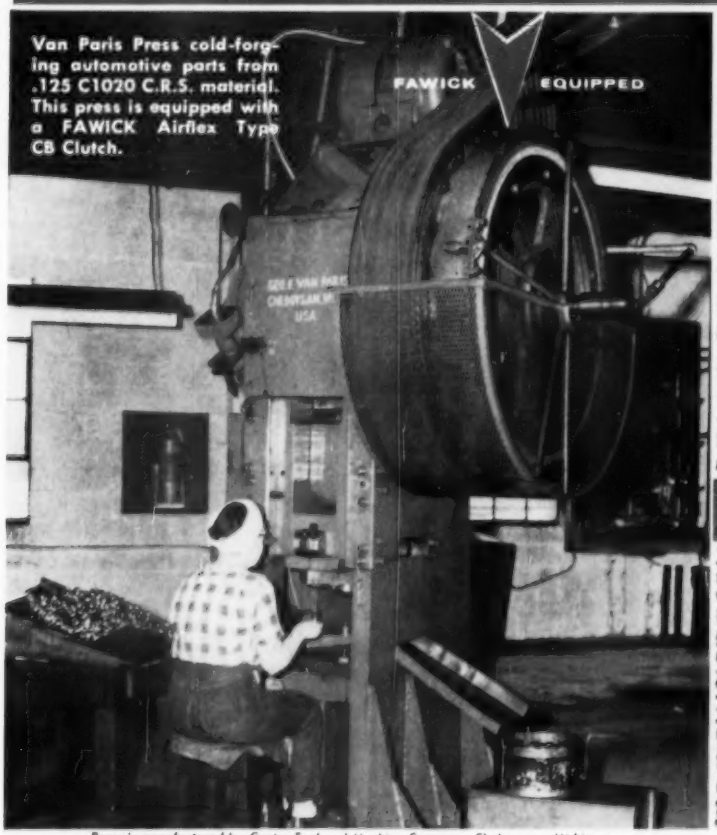
Carolina Power & Light Co.
RALEIGH / NORTH CAROLINA

FAWICK *Products in Action*
IN THE METALWORKING INDUSTRY



Van Paris Press cold-forging automotive parts from .125 C1020 C.R.S. material. This press is equipped with a FAWICK Airflex Type CB Clutch.

Press is manufactured by Center Tool and Machine Company, Cheboygan, Michigan

The famous FAWICK Airflex Type CB Clutch element used on Van Paris presses.

Typical automotive part cold-forged on Van Paris Press.

doing small press jobs in a *BIG* way!

HERE'S WHAT ONE FAWICK-EQUIPPED VAN PARIS PRESS IS DOING:

Operation—Cold-forging automotive parts from .125 C1020 C.R.S. material.

Product Rate—1800-2200 single trips per hour

Production History—18 months, and over 6 million 150-ton blows without interruption

Maintenance—None required

HERE'S WHAT FAWICK CLUTCHES CONTRIBUTE:

Lower Original Press Cost—through use of FAWICK standard packaged parts.

Faster Clutch Action—permitting exceptional single trip operation

Minimum Maintenance Cost—by greatly reducing down-time for wear adjustments or lubrication

Overload Protection—for machines and dies against double blanking, etc.

Exceptional, Smooth Press Control—for more accurate high speed work

Less Operator Fatigue—through instant-acting remote controls

These are typical of the advantages FAWICK Clutches, Brakes, and Controls will produce on your specific equipment. The nearest FAWICK representative or the Home Office will be glad to show how simply this can be done. Call or write today and you'll find out why "IT OPERATES BEST WHEN FAWICK-EQUIPPED".

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INDUSTRIAL CLUTCHES AND BRAKES

Plus Offices and Representatives in principal cities

Compare this latest jig borer for capacity accuracy speed!

New KNIGHT'S Jigmaster

Last word in medium size jig borers—unequalled for extreme accuracy, capacity, increased output.

The totally enclosed spindle and quill mounted on super-precision ball bearings, with quill moving in a solid bearing . . . the extra-wide base and reinforced column, both cast as a single unit . . . the wider bearing surfaces . . . all contribute to the Jigmaster's exceptional rigidity and accuracy.

Any one of three table and saddle locating devices may be used for hole location. All machine controls can be operated from a single convenient location.

Write For Complete Information

SPECIFICATIONS

Table Size	18" x 24"
Table Travel—Longitudinal	20"
—Cross	15"
Vertical Capacity	23"
Throat	20"
Weight	7500 Lbs.

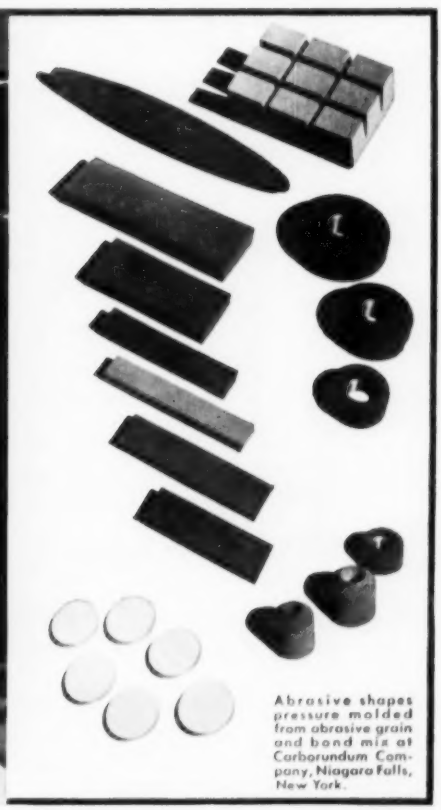
KNIGHT VERSATILE MILLERS ACCURATE · RIGID

W. B. KNIGHT MACHINERY CO. • 3920 WEST PINE BLVD. • SAINT LOUIS 8, MO.

Molding abrasives 50% faster with

DENISON *MULTIPRESS*®

with no downtime



Abrasive shapes pressure molded from abrasive grain and bond mix at Carborundum Company, Niagara Falls, New York.

PRODUCTION here has been increased 50% in molding of abrasive shapes. On operations requiring both molding and cutting, production is increased over 100%.

The operation is semi-automatic . . . the operator has only to remove the molded shapes.

The abrasive grain mix is hopper fed to a shuttle box. The shuttle box automatically indexes into position beneath the Multipress hydraulic ram. Ram pressure, set with hydraulic controls, is precisely duplicated on each stroke. Uniform density of abrasive grains is thus assured on every molded shape . . . with minimum operator training.

Molding dies are reset in a few minutes for different jobs.

What's your production problem? Compacting, riveting, staking, swaging, drawing . . . any operation calling for controlled ram pressure can be greatly improved with the Denison hydraulic Multipress. Have the Denison representative show facts and figures how you can benefit . . . now. Write

THE DENISON ENGINEERING COMPANY
1164 Dublin Road • Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

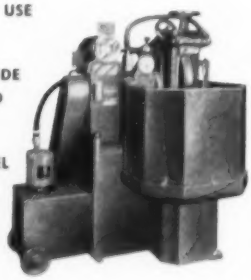
DENISON HydrOILics

ELIMINATE
Costly "Guess Work"

WITH THE

Oliver TEMPLATE TOOL BIT GRINDER

- POSITIVE DUPLICATION ASSURED BY USE OF A MASTER TEMPLATE.
- GRINDING ON SINGLE POINT CARBIDE TOOLS REQUIRES SECONDS INSTEAD OF MANY MINUTES.
- 20" NOTCHED SILICON CARBIDE WHEEL ELIMINATES DIAMOND FINISHING OPERATION IN MOST INSTANCES.
- MACHINE IS EQUIPPED TO PROVIDE WATER BOTH THROUGH THE WHEEL AND ON THE WHEEL FOR CARBIDE GRINDING.
- CAPACITY: TOOL BITS UP TO 1½" WIDE x 1¾" HIGH.
- SPECIAL SHAPES AND SIZES MAY BE HANDLED IN SPECIAL HOLDERS.



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Oliver INSTRUMENT • COMPANY

1414 EAST MAUMEE OLIVER OF ADRIAN ADRIAN, MICHIGAN

FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs*. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.
664 STATE ST. EXT., BRIDGEPORT 1, CONN.

3 important reasons you should use STAR "Moly"® High Speed Steel Blades

1 They outlast standard steel blades 10 to 1!

2 They assure high speed cutting performance second to none.

3 They are substantially lower in cost than any other type high speed steel blades!

Star was the first to successfully use molybdenum to make "Moly"® High Speed Steel Blades that would be tough, carry the load, retain sharpness and embody all the other high qualities and properties of heavy-duty blades. Order "Moly" High Speed Steel Blades from your Industrial Distributor. Rely on him for *all* your metal-cutting needs. Remember, he carries the complete line of STAR Hand and Power Hacksaws, Metal and Wood Cutting Band Saws and Hacksaw Frames.

FREE

Ask your Industrial Distributor for a supply of our NEW Metal Cutting Booklets and Wall Charts.

Sold Only Through Recognized Distributors

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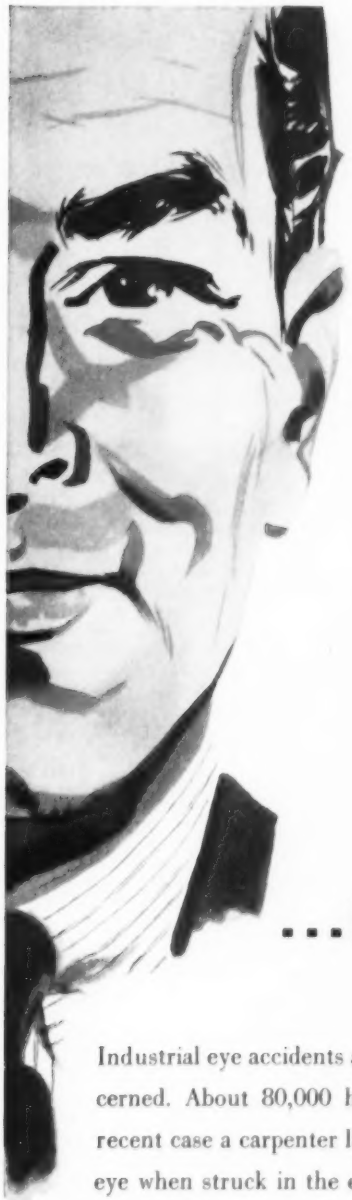
Makers of Hand and Power Hacksaw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Lawn Mowers.



He Saves Eyes and Dollars By Preventing Accidents Like This

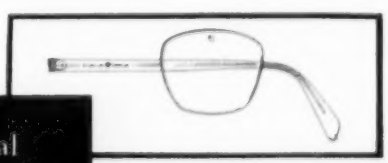
...He's A Safety Director!

Industrial eye accidents are costly — to *all* concerned. About 80,000 happen annually. In a recent case a carpenter lost the sight of his left eye when struck in the eye by an iron pipe on the job. He was awarded $3,562.50.

Accident prevention is a specialized business — and it belongs in the hands of a specialist — the Safety Director. He can prevent 98 per cent* of accidents like this when he has the full backing of management. He knows which rules work. He knows *quality* protective equipment and how it pays off.

In uninterrupted production, lower insurance costs and high plant morale he can *make money for you* as surely as a top administrator or salesman.

*According to the Society for the Prevention of Blindness 98% of eye accidents are preventable when workers wear safety glasses. Ask your AO† Safety Representative to call with case histories on the savings that have been made in your industry.



American Optical
SAFETY PRODUCTS DIVISION

Always insist on the AO trademark on safety lenses and frames.

†T.M. REG. BY AMERICAN OPTICAL COMPANY

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KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

Micrometric Travel Control for Lathes • Mills • Grinders • Drill Presses

Acra-Stop

cuts costs by increasing production —prevents waste

only **$130.00**

f. o. b. Santa Monica

The HOW with *Acra-Stop*

Accurate cutting to within one-tenth of a thousandth. Cuts set-up time nearly in half. Will produce a useable part, the second part off. The device makes it possible to set up an engine lathe with up to 80 precision stops in a 10" run.

SET UP AND RUNNING TIME CUT ONE-HALF with *Acra-Stop*

a typical example

Precision made and fully guaranteed . . .

Acra-Stops may be purchased direct . . . Send your Order TODAY!

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Wolverine

Heavy Duty

QUICK ACTION TOGGLE CLAMPS

Extra CLEARANCE

Extra SPEED

CQ-1100 Series

and now ***Extra SERVICE*** assured by the use of

HARDENED PINS & BUSHINGS

at all bearing points, in the popular C-100, CQ-1100, and CQ-800 series Toggle Clamps.

Rugged construction—drop forgings, cast steel and solid bar stock.

Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

CQ-800 Series

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WOLVERINE TOOL CO.

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MODERN CUTTING - OFF MACHINE

Cuts off longer pieces than regular automatic machines—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

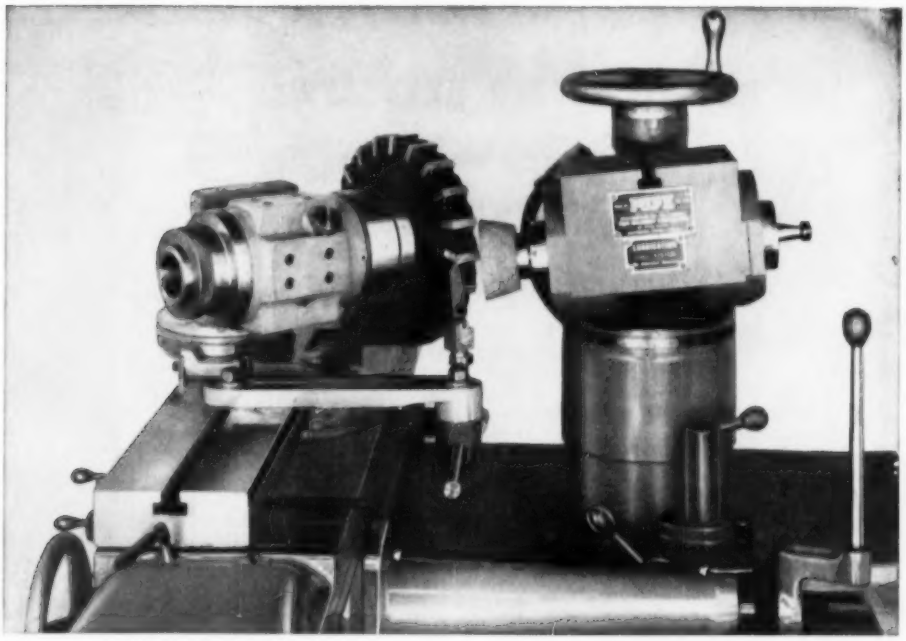
½" Tubing	¼" Cold Rolled	1" Tubing
Cuts and Chamfers both outside edges of ⅛" .035 wall tubing, 8" lengths, every 2.8 seconds.	Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.	Cuts and Chamfers both outside edges, pieces 3" long. One every 5 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¼" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG

MODERN MACHINE TOOL CO.

2005 LOSEY ST. JACKSON, MICHIGAN



COVEL NO. 12A . . . right on both counts

Send for new Bulletin 125 which shows how to grind tools with the No. 12A tilting head. Mail the handy coupon.

Right for PRODUCTIVITY. . .

It's important to you because tool sharpening time is production time—as much so as the production time of a milling, drilling or boring machine. On a Covel No. 12A, for example, grinding the periphery and chamfer of a 6-inch 8-tooth face milling cutter, including the two setups, required only 39 minutes to complete.

Right for ACCURACY. . .

Maintaining the efficiency and the quality of work produced by a machine tool depends on accurately sharpened tools. On cutters, reamers, slab mills and other tools sharpened on Covel No. 12A, easily established clearance angles are accurately maintained. Runout is held to a minimum, only .0005 on a 10-inch cutter. Quality finishes as low as 4 microinches also are obtained. You get longer use of tools between sharpenings, lower overall production costs.

Covel No. 12A features render older machines obsolete by comparison. No. 12A's Pope tilting and swiveling head saves time and money on every tool grinding job. The head has a motorized 1 h.p. spindle and is easy to adjust. Degrees of clearance are easy to establish and can be read directly in degrees from a scale on the head.

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. AM -126

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

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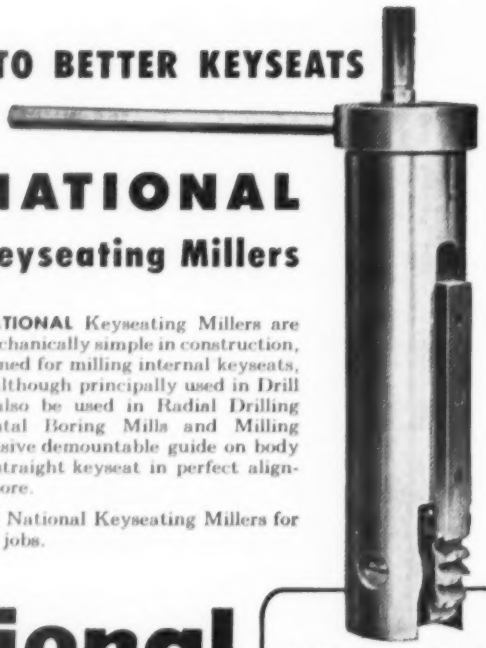

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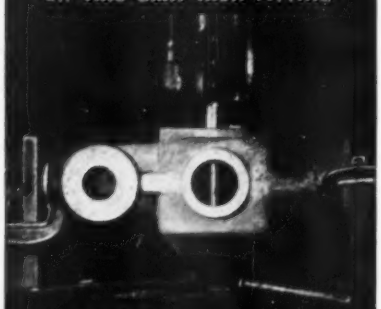

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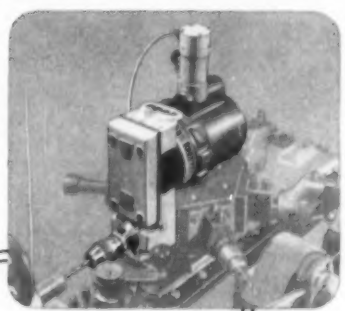

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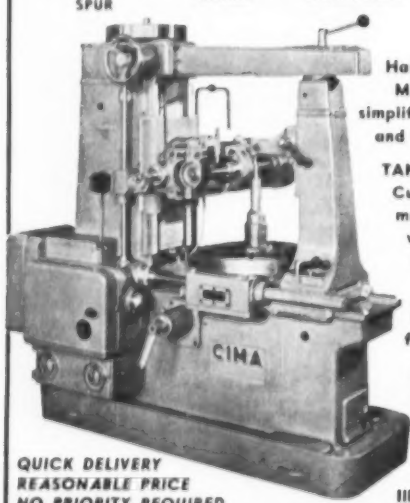

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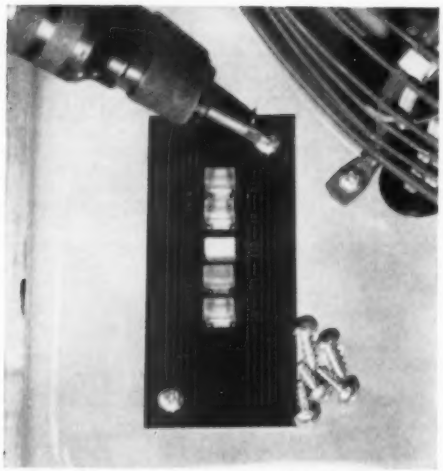

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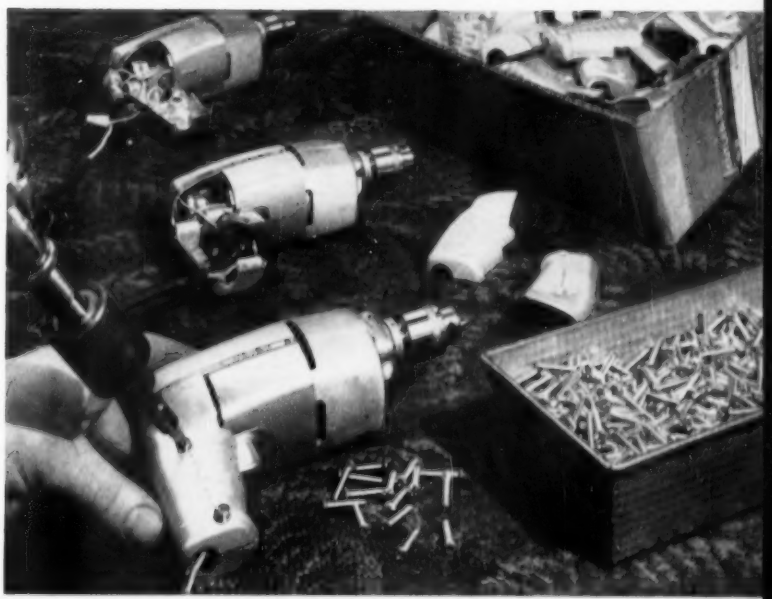
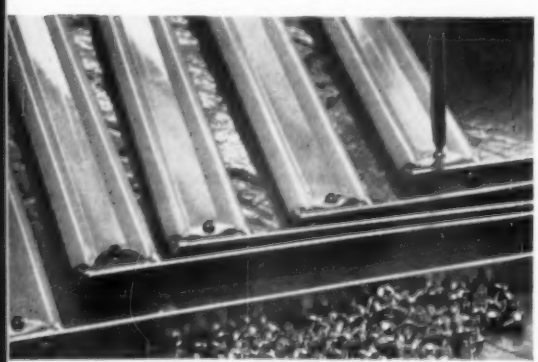


"WE USE MORE THAN 1,000,000 Phillips screws annually," says Mr. R. M. Shoemaker, liaison engineer for Portable Electric Tools, Inc., "they reduce danger of damage to finished parts, affect a tighter bond, upgrade production and enhance the appearance of our end product."



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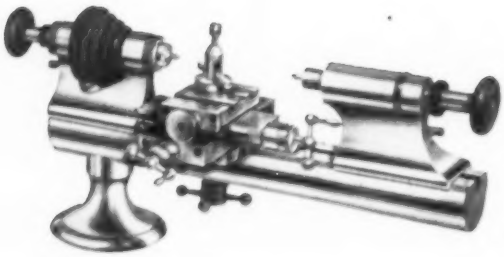

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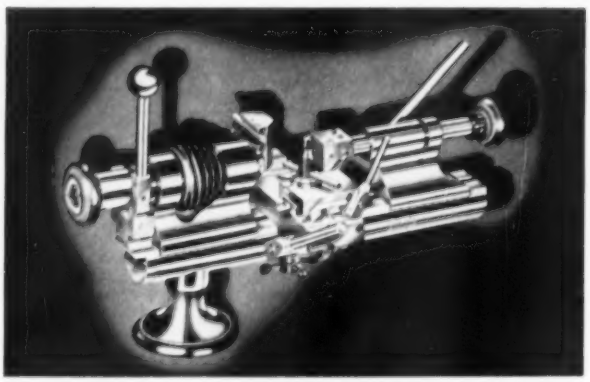

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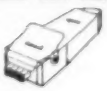

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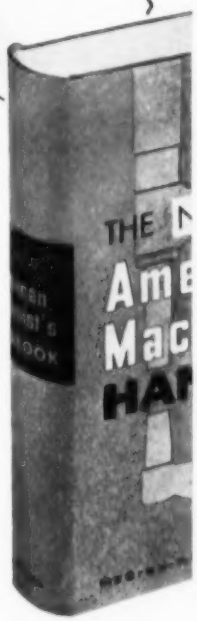

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the Surplus Machinery Market

"A bit softer, but still ahead of '55 levels" just about characterizes the surplus machinery market in most areas. A few notes of pessimism are creeping in because of slowdowns in the auto industry and the farm machinery industry, and because banks are raising the interest rates on machine tool purchases.

"One week sales will be good: the next week the bottom drops out of the bucket" a Midwestern dealer reports, but he admits sales are still ahead of this time last year. He adds that demand for top-quality production and toolroom machines is still high, but that the "dogs" are very hard to move. He's had a lot of dealer inquiries from the West Coast but few follow-up sales.

Another big Midwestern outfit says sales are running maybe 15-20% ahead of '55. This firm specializes in forging, rolling, upsetting and structural shape-forming machinery, has little trouble getting good quality machines of these types for resale. Most active movers in the Midwest: the big stuff like press brakes and elephant tools that take a long time to make and are needed long before a builder can fill the order. Smaller production and toolroom machines are moving, too, but slower than the big machines.

What about the Detroit market? Dealers who are right on the firing line in the auto industry's battle to get production back to high levels say business has picked up a little in the last couple of weeks, but it was pretty sick before that. Detroit people say when, as and if the long-awaited (some say "mythical") spring upturn in car output arrives, dealers think used machinery sales will pick up, too.

Outstate Michiganders, in sharp contrast to Detroiters, report "business is good—damn good.' They're not even kicking much about the prices of the machines they buy — except for the plants that have topnotch toolroom stuff to sell — they're "unrealistic."

Eastern dealers, particularly those in New York City, are upping their imports of used machines from Europe, but not to any tremendous degree. As one puts it, "Buying trips abroad are taken more for the vacation side than for the business side."

Think you have a tough time getting machines? Think of the dealer on the West Coast, where everybody's expanding, and practically no one is folding. The result: when a company buys a better-grade machine tool, it hangs on to the old one, too. Out there, there's one type of small multiple-spindle screw machine that has a delivery lag of four years for a new one. Consequently, if you want to buy a used one, you'll have to pay more than the new price tag.

Ohio dealers report that demand is staying high—particularly for boring mills and turret lathes. Trouble, as elsewhere is in getting the machines. One Ohio dealer says business is picking up in what he calls his "Crap Shooting Section." This section buys up six specials very cheaply, for example, hangs onto them until a customer comes along who wants that very machine. When four of the six are sold, the firm has turned a tidy profit.

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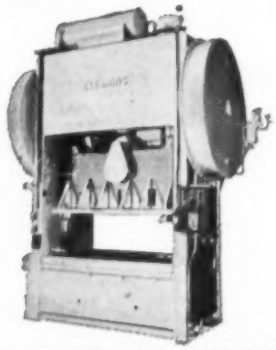

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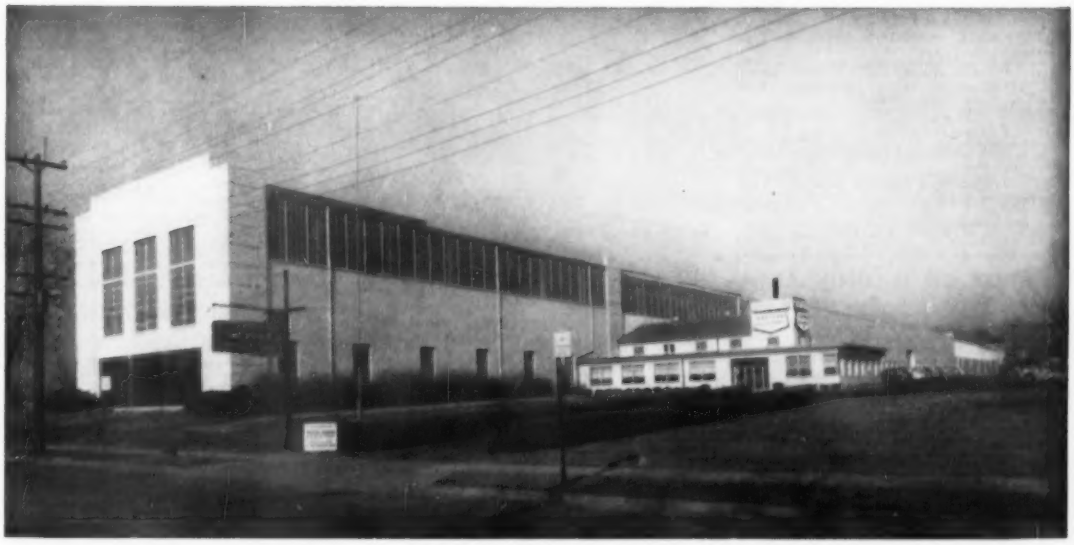

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6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
15" National Broach Red Ring Gear Lapper, m.d.
10" Pratt & Whitney Model M1639 Single Wheel Gear Grinder Machine, m.d.
18" National Broach Red Ring Gear Lapper, m.d., late

GEAR HOBBING MACHINES

Type A Barber-Colman, extended type, m.d.
Type A Barber-Colman, standard type, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman, Double Overarm, m.d.
No. 12 Barber-Colman, Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d., Spur & Spiral
No. 130 Cleveland Rigid Hobber

GEAR TESTERS

12" National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

AUTOMOTIVE GRINDERS

No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d.
Kwik-Way Model H Piston Turning & Grinding Machine, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle
Cincinnati Valve Seat Grinder, cap. ⅝" valve seat, m.d.

CARBIDE GRINDERS

14" Hammond Double End Carbide Tool Grinder
#44 Excello Double End
#48 Excello Carboloy 2 wheel Grinder, m.d.

CRANKSHAFT GRINDERS

18x66" Landis Universal Type C, m.d., late
22"x72" Landis Type CH, m.d., late

CYLINDER GRINDERS

No. 73 Heald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.
No. 50 Heald, m.d., 1944

KEYSEATERS

No. 3 Niles Cotter & Keyseat Milling Machine, m.d.

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LATHES

4 DE POTTER & JOHNSTON Automatic Turret Lathe. Late Type.

27" x 18' MONARCH "N" Geared Head Lathe, 11' Centers, Taper Attachment, Full Equipment. Late Type. 1942.

24" x 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

12"/18½" x 6' MONARCH Toolroom Lathe. 1944.

DRILLING MACHINES

6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive. Late Type.

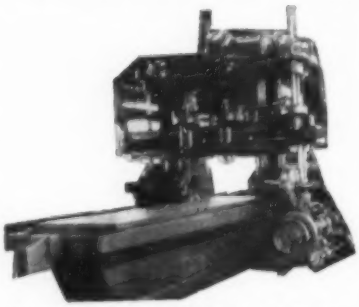
MILLS

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

No. 2B BROWN & SHARPE Horizontal Mill, Motor in Base. Late Type.

42" x 36" x 12" INGERSOLL Planer Type Mill, Two Heads on Rail, Two Side Heads, M.D.

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

No. 2 CINCINNATI Horizontal Dial Type Mill, Late Type, Vertical Head. 1943.

PRESSES

No. 91-C TOLEDO Straight Side Double Crank Power Press, 27" x 36" Bed Area, 60 tons cap., M.D.

No. 8 BLISS CONSOLIDATED 90 Ton Cap., O.B.I. Geared. Air Cushion. M.D.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

42 Tons C-14 FERRACUTE O.B.I. Press 4½" Stroke. New 1946.

GRINDERS

No. 2 CINCINNATI Universal Tool & Cutter Grinder. Late Type.

4" x 12" LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLLS Face Mill Cutter Grinder, M.D. Late Type

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 208 BESLEY Motor Driven Disc Grinder, 26" Wheels. Late Type.

MISCELLANEOUS

No. 18 MARVEL Hydraulic Roll Stroke Power Hack Saw, 18" x 18" cap., M.D.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

No. 1, 2, BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

½, 1½ **BUFFALO FORGE** Universal Ironworker, Notcher and Coper, M.D.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

10' x ⅝" Cap. LONG & ALLSTATTER Shear.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

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PARTIAL LISTING
BORING MACHINES

Foote-Burt Vert. 26" sw. new 1941
#49 Heald Borematic, new 1944

DRILLS

1 spdl. 14" sw. #2 Avey, new 1945
1 spdl. 20" sw. #2LMS L. G., 1945
1 spdl. 24" sw. #2MA6 Avey, new 1942
1 spdl. 26" sw. #4MS L. G. hydraulic
2 spdl. 24" sw. #3 Avey, AC MD
3 spdl. 26" sw. #2LMS L. G., 1942
5 spdl. 24" sw. #2MS L. G. new 1943
4 spdl. 14" sw. #2LMS L. G. new 1942
6 spdl. 20" sw. #2LMS L. G. new 1943
#314-A Baker Univ. H.D., 1943
16 spdl. Fox #K60H, #2 taper, 1944

BORING MACHINES

Foote-Burt Vert. 26" sw. new 1941
#49 Heald Borematic, new 1944

GRINDERS

3"x12" #3 B&S, Rap. Trav., 1948
4"x12" #4H Landis, 1942
4"x18" No. 4H Landis 1943
6"x18" Norton Type C, new 1943
10"x48" Norton Type C, new 1943
10"x36" Norton Type C, new 1942
10"x18" Norton Type C, new 1943
10"x72" Hill-Clarke, AC Mot. Dr.
10"x36" Hill-Clarke, AC Mot. Dr.
10"-20"x36" Norton, angular wheel
14"x48" Landis Type C, new 1941
16"x72" Hill-Clarke, AC Mot. Dr.
16"x26"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x90" Hill-Clarke, AC Mot. Dr.
18"x120" Norton Plain Cyl.
20"x192" Norton, AC Mot. Dr.
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl
14"x48" Landis Type C Univ. chuck
#371 Heald Size-Matic, 1950
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-38 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc 1940
#18-30" Blanchard Rot. Surf.

LATHES

16ML-16"x36" LeBlond Auto.
#16ML-16 LeBlond Semi-Auto. 36" cc
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
54"x42" Fay Auto. AC MD
16"x176" Putnam Grd. Hd. MD
R14 Seneca Falls, 16"x36" 1942
120"x96" cc N-B-P, ser. 3380
#3W Cinn Arme Univ. Turret
#1 Gisholt Univ. Tur., A & B F
#3AL Gisholt, cross slide Tur. 1941
#3H-10 Libby H.D. Tur. 1942
#4A W&S Turret, new 1941
#FU Easternatic, tur. 33" sw. 1944
#8D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rot.
#28-60 Cinn. 4 Spdl Vert Hydrotell
#36-72 Cinn. Horiz. Hydrotell, 1942
16"x60" P&W Mod. B Thread Mill
54"T L-B Thread Mill new 1942
No. 2 Cinn. Univ. Hi Power
#36 Van Norman, Rebuilt, 1941
#1-18 Van Norman Prod. 1942

PLANERS

36"x36"x12" Rockford Openside '42
60"x48"x27" American, 4 hds.
60"x48"x30" Hamilton, 4 heads

MISCELLANEOUS

#3L La Pointe 15T Horiz. Broach
6" Goss & DeLeeuw 8 spdls. 1941
#36S Barnes Vert. Hone, new 1942
15 Ton Hyd. American Press, 1946
#11RD 2 Hd. W&S Tapper, latest
#12HS G&E, 12" cap. Gr. Hobber
#36HM G&E 3 Spdl. Bevel Gr.
#61A Fellows Gr Shaper, 18" cap.
#5A Kaufman Pneu Tapper, 1947
#HHS Barber-Colman Sharp Mach.
16 ga. 42" Economy Power Shear
6"x6" Peerless H.D. Hacksaw, 1943
15 T Toledo Overhead Crane, 39½'

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Capacity 90 ton, stroke 4 inches, RPM 44, shut height over bolster plate. Stroke down, adjustment up 13¼", Bolster plate 28 x 40½ x 4" thick, 1 extra Bolster plate.

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1¼" Dia. Capacity. This equipment is in top shape, we are discontinuing the product line for which they were purchased. They have had relatively little use, they should be a rare find. The equipment is available immediately, call or write to:

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500 Machine Tools • 1000 Tons Steel

Excess to the Consolidaton Program of the Eddystone Divison of

BALDWIN-LIMA-HAMILTON CORPORATION

Eddystone, Pa.

TUESDAY and WEDNESDAY, JUNE 26 and 27, 1956

at 10 A.M. (dst) Each Day on the Premises

Baldwin-Lima-Hamilton Corporation is consolidating the operations of its Eddystone Division into the Southwark Plant and certain machine tools and steel are excess to its present needs. The excess Real Estate has been sold, therefore immediate removal of the tools and steel is necessary.

STEEL — Approx. 1000 Tons Cold Roll Bars, Flats, Squares, Sheets, Angles, Channels, Tees, Zees, etc. Alloy Plate Spring Steel, Ground Steel and Aluminum Sheets and Bars, assorted.

48 DRILL PRESSES — 24 Upright 1 to 6 Spindle, 12" to 28" Swing; 24 Radial Drills 3' to 6' Arms, 9" to 15" Columns.

26 MILLING MACHINES — Plain, Universal, Vertical and Slab.

86 LATHES — 16 Turret Lathes, 6 Portable, 2½" to 3½" Capacity, 10¼" to 22" Swing; 10 Vertical Turret Lathes, 24" to 50" Tables; 60 Geared Head, Quick Change, Back Geared, Heavy Duty and Precision Toolroom and Engine Lathes, 16" x 54" to 48" x 22' Centers.

14 SHAPERS — Crank, Radius and Duplex, 14" to 32".

8 VERTICAL SLOTTERS — 20"-22" Stroke, 24"-34" Tables.

23 THREADING MACHINES — 2 and 4 Head, 1" to 8" Capacity.

44 PLANERS — 3 and 4 Head, 36" x 36" x 10' to 64" x 72" x 21'.

48 BORING MILLS — 30 Horizontal 2½" to 8"; 18 Vertical 42" to 72" Tables.

47 GRINDERS — 5 Plain Cylindrical 10" x 72" to 16" x 120"; 42 Internal, Cylindrical, Surface, Cutter and Tool Bench and Pedestal Grinders.

SAWS — Hydraulic Universal Roll Stroke Hack Saw; Grob and DoAll Job Selectors; Contour Band Sawing and Filing Saws; Cold Saw; Power Hack Saws.

7 AUTOMATIC SCREW MACHINES — 1 to 4 Spindle, ⅜" to 4" Capacity.

2 POWER PRESS BRAKES — 8' and 10'.

8 POWER SHEARS — 1 Alligator, 30" Blade, Capacity 8" x 8" Billets, Gear and Motor Drive; 7 Rod Bar and Squaring Shears, Assorted.

FORGING MACHINES — 9 Horizontal Forging Machines, ¾" to 5"; 17 Straight Side Power Trimming Presses, 10 to 500 Tons; 20 Steam Drop Hammers, 800 to 4500 Tons, 7 Horizontal Hydraulic Forging Presses, 20 to 350 Tons; 3 Hydraulic Throat Shears, 10"-18".

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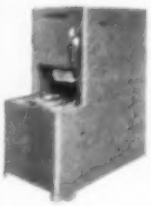
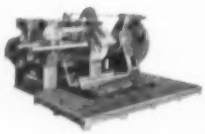


THREE No. 16 GLEASON QUENCHING PRESSES

New in 1953, like new, complete. For immediate delivery.

One— Model No. 17 GLEASON SPIRAL BEVEL

Hypoid and Zerol Bevel Gear Grinder, with "Automatic" cycle, wheel - dressing, etc. Perfect condition.



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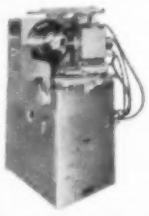
Herringbone Gear Generator, new in 1939 with tremendous lot of equipment.



Two— Model No. 2 GLEASON HYPOID GENERATORS

with lots of change gears, generating cams, like new.

No. 1248 KEARNEY & TRECKER

"Bridge-Type" Vertical Production Milling Machine.

Model 5-54 CINCINNATI

Duplex "Hydrobroach" Twin-Ram Surface Broaching Machine, in perfect condition, for immediate service.

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Will Carburize, Cyanide or Harden about 200# of small parts an hour. Complete Unit with Syntron Feeder and all Electricals. This unit is almost new. Will sell at about 30% of cost. Send for specifications.

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Lathe, 18" American, 9' bed, 7' between centers.
Planer, Cincinnati, 60" table, 72" between housing, 17'8" long.
B.G. Crack Shaper, 24" Cincinnati.
Air Hammer, 30" Morgan.

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NILES VERT. BORING MILL 120", 4 jaws; 2 hds. on rail. OPEN.

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#675 New Britian Chucker, 7½" cap.
#00G Brown & Sharpe

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48" Newton continuous rotary mill.

28"x20' bed Lodge & Shipley lathe, 10 HP Turner drive, taper attachment.

No. 8 Buffalo Bar & Billet shear.

No. 2 Cincinnati tool & cutter grinder, new 1941.

Model 5-48 Cincinnati hydraulic duplex mill, new 1941.

Model 34-36 Cincinnati duplex mill, serial 3B33D14-4.

No. 74 Heald hydraulic plain internal grinder, w/cross-sliding H.S., new 1941.

No. 72A5 Heald hydraulic plain internal grinder w/extended bridge, new 1943.

No. 1-H-18 Kearney & Trecker simplex mill, late.

2000 Ton No. 6 National Maxipress, all steel frame.

7" No. 76H Baird Chucker, new 1943.

Pratt & Whitney Kellering Machines (6).

Model M24 Kearney & Trecker manufacturing mill, new in 1945.

24" No. 314 Baker Brother H. D. Drill.

16 Spdl No. D20H Natco multiple drill, 1943.

36" No. 36H Gould & Eberhardt gear hobber.

No. 2 Cincinnati filmatic bearing centerless grinder.

4" x 12" No. 4H Landis plain hyd. cylindrical grinder, 1943.

13" x 60" Hanchett vert. spdl. surface grinder, late.

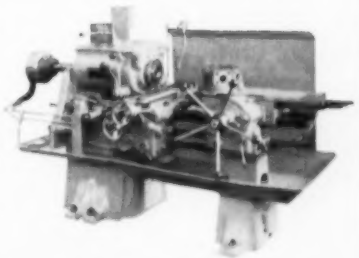
6" x 18' Norton horiz. spdl. surface grinder.

126" x 96 ft. cc. Niles Bement Pond engine lathe.

15"x30" Lipe Carbo-Matic production lathe, 1942.

36" Rockford hydraulic openside shaper-planer.

36" Rockford hydraulic vertical slotter, new 1944.



No. 3 Gisholt ram type universal turret lathes (2), serial nos. 749-9 and 2809-3, new in 1942. Reconditioned and guaranteed.

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100" Niles vtl. Boring Mill—1952 w/2 swiveling rail heads and side head, hydraulic feed. Main drive motor—50 HP.

27" Birdsboro Vtl. Boring Mill.

5" Univ. Horiz. Boring Mill, Hi-spd. w/thread. att.

10" Horiz. Boring Mill. (Used one year.)

8" x 18" Cinc. Tool & Die Mill w/depth control, 1952.

DoAll Mod. 36 Hydro-feed Contour Saw.

25" Monarch Mod. N Lathe. Factory-raised in sand to swing 36-¼" - 48" cc w/air tracer, 1950.

NEW PFEIFER Horiz. Boring Mills & Toolroom Lathes. (Acclaimed the world's most accurate.) Write for Firm Proposal.

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Selling Opportunities Wanted
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SEARCHLIGHT EQUIPMENT SPOTTING SERVICE, c/o American Machinist, 330 W. 42nd St., N. Y. 36, N. Y.

Your requirements will be brought promptly to the attention of the surplus equipment dealers advertising in this issue. You will receive **replies directly from them. NO CHARGE • NO OBLIGATION**

Please help us locate the following equipment:

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NAME ..... **TITLE** ..... **COMPANY** .....

STREET ..... **CITY** ..... **ZONE** ..... **STATE** .....

6/4/56

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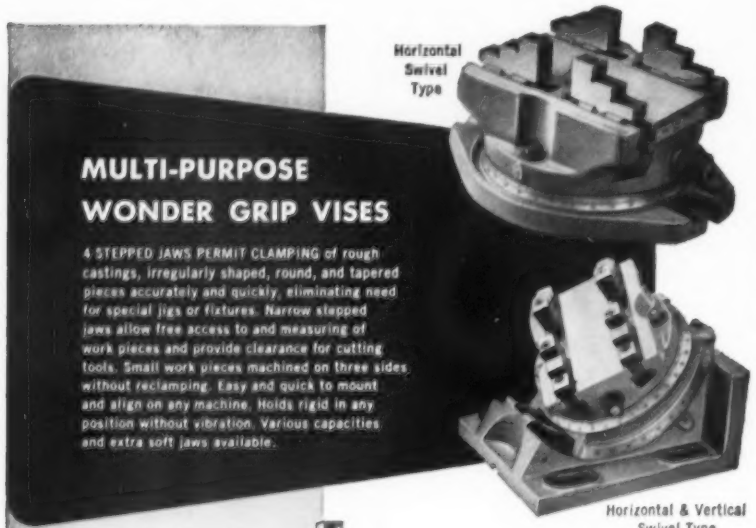

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IRD Balance: *final dimension of precision*

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1. Cut unproductive downtime for wheel balancing by 600%.
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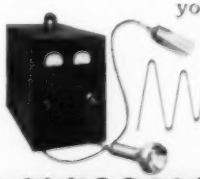

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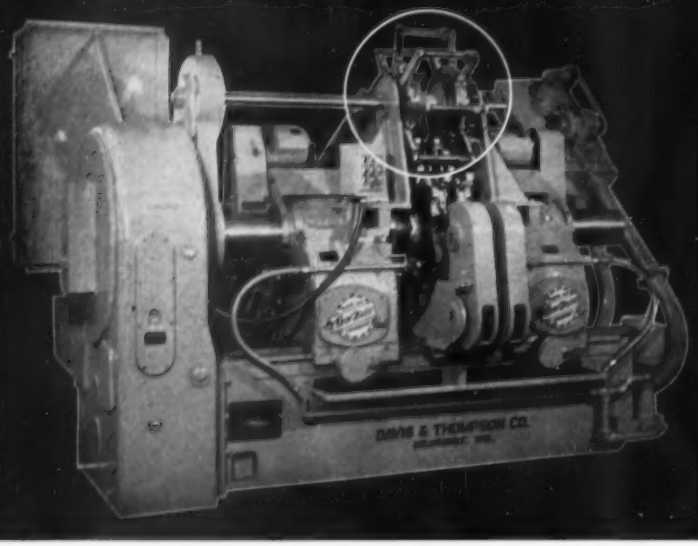

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WATCH always for the jobs you *can't* do—well. Specialized equipment and specialized knowledge outside may be worth the extra cost in reduced scrap and headaches. Sometimes the price may be less too—and it costs nothing to get an estimate.

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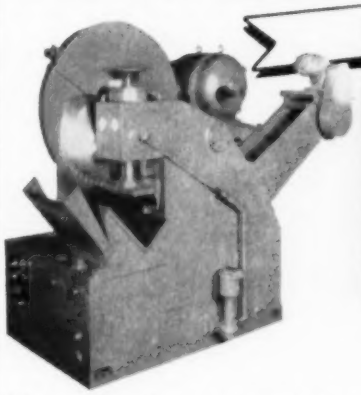

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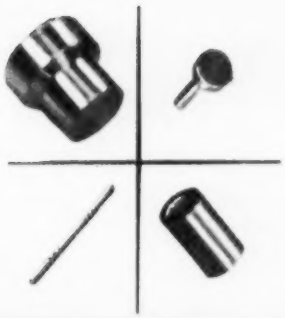

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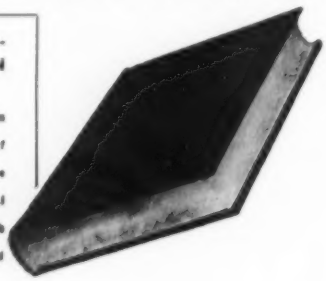

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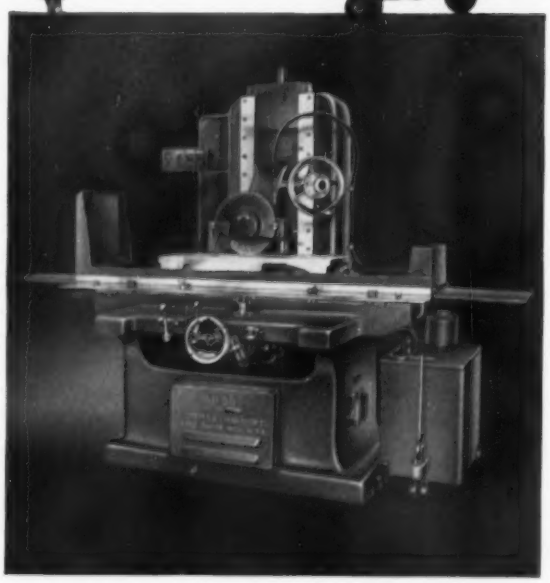

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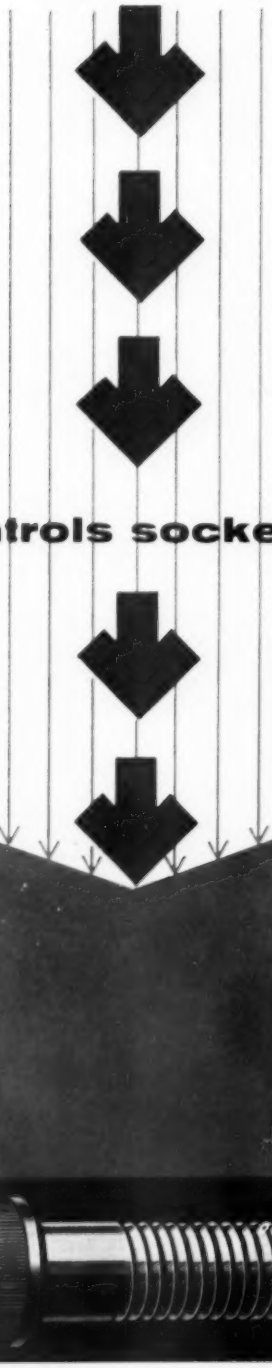

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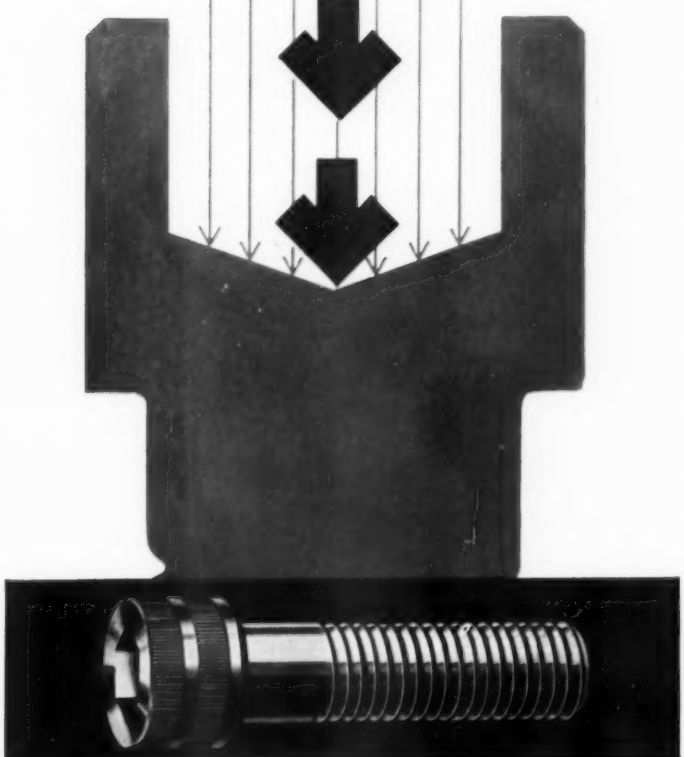

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